



FRIDAY, MARCH 2, 1894

CONTENTS.

ILLUSTRATIONS:	PAGE.	NEW PUBLICATIONS:	PAGE.
De Kalb Ventilating Car Window.....	151	General News.....	162
Vesibules.....	152	Car Building.....	164
Lyon Brook Bridge, New York, Ontario & Western.....	154	Bridge Building.....	161
Saunders' Hoisting and Conveying Machine.....	155	Railroad Law.....	165
Leach's Improved Track-Sanding Apparatus.....	155	Meetings and Announcements.....	165
Counter Bore and Tracing Tools.....	155	Personal.....	167
The Protection of Ties.....	156	Elections and Appointments.....	167
Rate of Combustion as Affecting Evaporation in Locomotive Boilers.....	157	Railroad Construction.....	167
A New Steel Fence Post.....	162	General Railroad News.....	168
CONTRIBUTIONS:		Traffic.....	168
Automatic Signal Patents.....	151	MISCELLANEOUS:	
Mechanical vs. Pneumatic Interlocking.....	151	Technical.....	162
EDITORIALS:		The Scrap Heap.....	163
The Responsibilities of a Railroad Director.....	160	The Safety of Compressed Gas.....	165
Smokebox Vacuum, Temperature and Cinders.....	160	Chicago Traffic News.....	165
The Present Status of the Car Coupler Question.....	160	Lake Shore Witnesses Excused from Testimony.....	166
The Railroad Bond Market for February.....	161	Illinois Railroad Inspector's Report.....	167
EDITORIAL NOTES.....	161, 162	Texas Railroad Commissioner's Report.....	157
		Analysis of Boiler Tests, by Bryan, Donkin and Kennedy.....	158
		The Relation of Railroads to the Public.....	159
		Russian Railroad Notes.....	162

Contributions.

Automatic Signal Patents.

SWISSVALE, Pa., Feb. 27, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A perusal of the letter of the President of the Hall Signal company, printed in your last issue, shows that we are indebted to him for stating so forcibly the claims of the Union Switch & Signal Company that the track circuit and overlapping signal system offered by the Hall company to the Delaware, Lackawanna & Western Railroad and other roads is an infringement of patents owned by our company, whose rights in the matter have been respected for so many years. It is not true, to our knowledge, that the Hall Signal Company has been using the track circuit system for a long period. We understand that they did make an experiment in the fall of 1892.

The President of the Hall Signal Company advertises as follows:

"The question of the relative merits of different automatic signals resolves itself into this: Which one will operate 100,000 or 1,000,000 times with the least number of unnecessary stoppages of trains? On this basis the track circuit is found wanting, both in the theory of its construction and on the records of actual work. . . . We are prepared to erect signals on this system for those who deliberately desire such."

Since the date mentioned above, the Hall company, apparently on account of the weakness of its own system, depending upon track instruments, has concluded that the track circuit system is the only safe one known, and, it seems, has not hesitated to appropriate the inventions developed and owned by this company, and which give to it the exclusive right to furnish a safe track circuit system of signals. In order that there may be no misunderstanding in regard to our rights, we now state that we have instructed our attorneys to bring suit against the Hall company for the infringement of such of our patents as they are now using.

In conclusion, we may say that the signals adopted by the Delaware, Lackawanna & Western are colored disks operated within inclosed boxes, which are visible for only a short distance, and therefore cannot possibly afford safety to the railroad; and that this phase of the question, as well as the infringement of this company's patents, has been properly stated to the officials of the Delaware, Lackawanna & Western.

THE UNION SWITCH & SIGNAL CO.  
E. H. Goodman, Vice-Prest.

Mechanical versus Pneumatic Interlocking.

NEW YORK, Feb. 13, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your correspondent, F, criticises my expressed opinion that the ordinary lever interlocking is more suited to railroad work than the pneumatic. I infer that he wishes you to believe that the opinion of an expert engineer should be treated with the same contempt as the joke-besmirched representations of a professional salesman. But, although there are, alas! too many quack signal engineers, there are also those to whom their calling is tantamount to truth and honor.

F has discovered that Mr. O'Donnell's "simplex" device, as used at Waterloo Station, is really a selector. This is not strange, when we consider that he, in common with myself and many others, was a pupil of Mr. Henry Johnson, the inventor and christener of the selector.

Allow me at this point to explain the reason for the former indiscriminate use of selectors. About ten years ago, most railroad managers were thoroughly convinced that there should be a separate signal for

every possible movement. But this in many cases would have so increased the cost (and to a much greater extent with the pneumatic), as to at that time postpone the work indefinitely. We were thus warranted in compromising by the introduction of the selector. In course of time the railroad officers modified their views, which in some cases have changed to the opposite extreme, to the extent of prohibiting more than two signals on any one pole. It is obvious that under these modified conditions, the need of selectors is much less, but they have still their legitimate use as lever-saving devices.

F is pleased to inform you that there is as much likeness in the situations at Waterloo Terminus and Stewart avenue crossing as between an "oyster and a feather bed." There is some likeness between these two articles, inasmuch as they are both soft, as are also some statements. I fail to see why the two plants are not comparable. They both deal with railroad trains running over similarly constructed tracks. The other factors, viz., volume of traffic and number of tracks, are greater at Waterloo than at Stewart avenue, although F makes the misleading statement that there are but six tracks at Waterloo and 19 tracks at Stewart avenue. Allow me to inform him that there are more than 20 tracks at Waterloo.

Then again it is not necessary to explain to a railroad superintendent the much greater amount of work per track, for each schedule train, at a terminus, than at a crossing, with the endless movement of empties and road engines, in addition to the regular train movements, in the former case. The train movement at Waterloo is, I believe, greater than at any other station. It is true that there are a greater number of switches at Stewart avenue than at Waterloo station, but then it surely is not necessary to explain that the majority of movements at a grade crossing are straight through, whereas at a terminus there is a much greater amount of switch throwing. So much for the De Wolf Hopper simile.

Our friend F accuses me of discreetly passing over the damage done to lever connections in case of accidental derailment of a train. The fact is that in nine out of ten such cases there would be more damage done to the electro-pneumatic cylinders than to the few cranks and rods in proximity to the switches. This is a minor point in any case, but it tempts me to say that if, as F suggests, it should be the advantage most emphasized by advocates of electro-pneumatic interlocking or any other combination of elements, over the well tried, sufficient and economical lever interlocking, the less they say about it the better.

ARTHUR H. JOHNSON.

The De Kalb Ventilating Car Window.

Herewith is an illustration of the De Kalb improved ventilating window, which is in experimental use on the Delaware, Lackawanna & Western. It consists of a single sash with a horizontal mullion dividing the full-sized window into two panes, so that it has the outside appearance of a regular two-sash window. This single sash, instead of being raised like the ordinary car window, is hinged at both sides by four butt-strap hinges (fig. 1), the straps of which are fastened to the jambs of the window. The strap is in two pieces. The sepa-

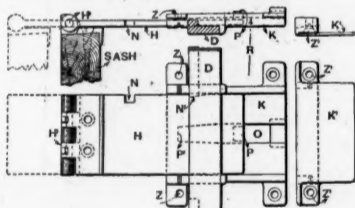


Fig. 1—Hinge for De Kalb Car Window.

rate piece K is mortised into the jamb-post of the window underneath the stop and screwed tight, and the part hinged to the butt is free to slide upon it for a distance of about three inches, and no farther, it being stopped by a lug P striking P'. K' covers and fits upon K, being held by screws through the holes Z' and Z. N is a slot into which the locking bar engages.

Fig. 2 shows the arrangement of the window and the hinged sash. In Fig. 2 the plan shows two positions of the sash, the one at the left hinged for the train to go to the left, and the one at the right showing the sash straight as if open at both ends. As the car moves to the left the air rushing past the inclined window produces a suction, shown by the directions of the arrows, which draws out the impure air of the car, fresh air being supplied by the deck sash overhead. Underneath, and at the bottom of the window is a brass shield S, also shown in fig. 2, which prevents the admission of any dust from underneath. Over the window is a weather board extending out the full distance that the sash may go. This is shown at W. The notches shown in the strap H, fig. 2, and at N N', fig. 1, limit the distances that the window may be pushed out, giving more or less ventilation as may be desired by the passenger. If both sides of the window are pushed out at the same time, dust and smoke would be admitted directly in the forward opening; and to prevent passengers indulging in this practice to the annoyance of other persons, a device shown in the elevation, fig. 2, is provided. It consists of a long locking

bar, B, which is moved by a lever, L. This locking bar is notched at both sides of the window and engages with upright bars, D, which lock the hinges. At either side of the window each upright bar fits into the notches of the windows shown in fig. 2 at H. This drop bar is shown at D in figs. 1 and 2. The notches in the long locking bar B are so distanced that when the drop bar on the left side is engaged, the one on the other side is free to be pushed up and disengage the two hinges upon that side of the window. This locking bar runs throughout the length of the car and by one movement of the lever may be made to secure all of the hinges upon one side of all the windows. The trainman is supposed to throw this lever so as to lock all of the forward hinges of the windows, leaving the rear sides free to be opened. The locking bar is provided with a link at the lever end so that in any attempt to push the bar it will buckle, the intention being that the lever shall be utilized only

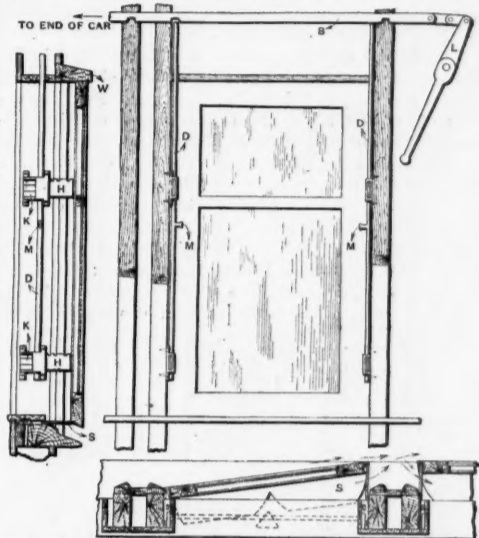


Fig. 2—The De Kalb Ventilating Car Window.

to pull the rod and not to push it. Levers are therefore provided at both ends of the car. The principle of ventilation is the same as that of the deck sash of the Manhattan elevated cars, except that in the De Kalb system every window may be opened, while in the elevated cars only every other window is opened, the alternate windows being opened when the train changes from northbound to southbound, and vice versa.

Some advantages of this window are cited as follows: It will effectually prevent people from entering the car by the window or thrusting out their heads and arms and suffering the serious injury incident to such practice. It will avoid many a hard cold and its serious consequences to imprudent people who ride with open windows; insuring at the same time perfect ventilation without exposing passengers to direct draught from the windows. The health and comfort of one passenger is not affected by others in front of him raising their windows. If a passenger desires ventilation he secures it by inducing the impure air to go out and fresh air to come down from overhead. In a very hot day when there is neither smoke nor dust, both sides of the window may be opened, thus insuring direct draught if passengers so desire. The window opens about 2 in. and gives an area for ventilation of 156 sq. in. when both sides are opened, which is equivalent to the ordinary window being raised about 6 in. This is important to passengers who are waiting in a car in a covered station on a hot day. The windows close tightly against rubber weather strips and give quite as tight a window as the ordinary style. The efficiency of the device has been demonstrated by passing through long tunnels with the sash open. In one instance the tunnel was about a mile long and the wind was blowing the same direction that the train was going. Little or no smoke entered the car so long as the train was in motion and none whatever at the windows. The smoke that entered came in at the ventilating windows overhead, and before it became noticeable the train had left the tunnel and it was quickly drawn out by the ventilating windows, causing no inconvenience or discomfort. In sleeping cars it will afford special relief by exhausting the foul air from the berths. A window can be left open with the utmost prudence, the air exhausted coming in from the deck windows overhead. The cars may be built stronger over the windows, thus requiring to be made hollow. In winter the deck windows may be kept closed and the ventilation secured below, thus retaining the heat of the car which ordinarily rises and escapes through the deck windows.

The under sill of the window is ventilated and will not rot or decay, it being necessary to have an open space for the brass shield S to slide in. A minor consideration is that this window is more perpendicular to the direct line of sight through the window, thus giving one the impression and pleasure afforded by a bay window. Windows for sleeping cars are made with double panes of glass. The shades are attached directly to the sash, thus bringing them close to the window. A car with these windows has been in service on the D., L. & W. for several months, and has given complete satisfaction.

### Vestibules, Platform Canopies and Hoods.

For 45 years or more inventors have been engaged in designing and perfecting structures and mechanical apparatus that should fill up or inclose the intervening space between cars of a train. Such men of genius as Sir Henry Bessemer have considered it of enough importance to give it their attention and to make it the subject of letters patent; and 100 other inventors of more or less notoriety have sought and obtained patents from the United States and other governments.

The functions to be performed by all these inventions are five in number, namely: (1) to resist the injurious effects of collision, (2) to prevent oscillation, (3) to lessen the resistance of the air, (4) to insure good ventilation, and (5) to make a covered passageway, and thereby affording greater security and comfort to passengers. Usually the earliest inventions accomplished but one of these purposes, but the vestibule of to-day is calculated to secure all these advantages.

The earliest and most primitive attempt to fill in the space between cars was made by an Englishman named Fuller in 1845, and is illustrated in fig. 1. For the device he received a patent. It interposed elastic cushions, leather or rubber sacks of wool or other flexible materials between the ends of cars to resist collision. He was followed two years later by one Symons, who received a patent on a connection between cars described as buffers attached to the ends of cars at or near the top as distinguished from platform buffers. The patent contained the following explanation: "It is obvious that when cars are in a train moving at high velocity and are attached to one another at one point in the

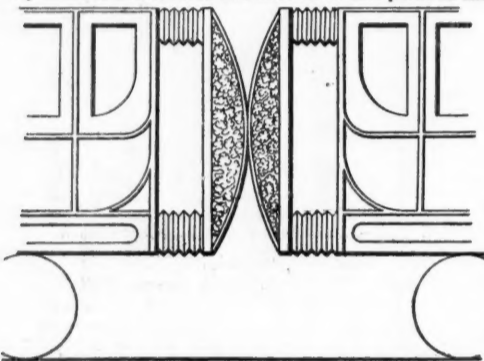


Fig. 1—Fuller's Patent, 1845.

center as at present, they must have a separate tendency to oscillate or rock from rail to rail. It is also obvious that if the carriages are attached at two points as above provided for, the tendency to oscillate would be counteracted, if not obviated entirely." But this specification was in connection with an improvement for the purpose of traction and propulsion, on which ground the courts refused to recognize it in sustaining recent patents. The patent also explained that in case of shocks the top buffer would prevent the force of the lower buffer from causing cars to rise, override or fall upon one another. These two cases are interesting because they suggest as early as 1847 functions 1 and 2, namely, greater protection of the superstructure in case of collision, and the diminishing of oscillation, the former embodying that of collision, the latter that of collision and oscillation.

Sir Henry Bessemer in the same year, 1847, introduced and patented the idea of the hood or canopy and embodied the principle of lessening the train resistance by covering over or closing the opening space between the ends of cars. It is illustrated in fig. 2, and consisted of

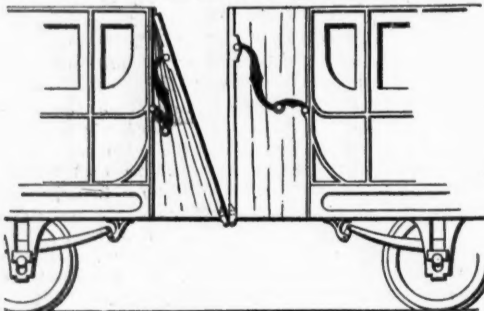


Fig. 2—Bessemer's Canopy, 1847.

a frame plate or bow pivoted at the bottom to the buffers, moved with them and forced out at the top by a spring. It can be expanded and folded back and is the first introduction of the frame plate and a spring to force it out.

In 1852 an Englishman, Garvey, patented a buffer in which he embodied all the functions of the earlier patents, or, as he describes it, "a device for more effectually dissipating the shock of collision, reducing the surface exposed to atmosphere resistance and diminishing oscillation." He describes the device, shown in fig. 3, as shields or frames attached to and covering the ends of cars, which frames are supported on the ends of four rods attached rigidly to the car body at or near its four corners. The shields were attached to the ends of the four rods by means of solute springs. They were light and covered with felt

and were forced into close contact when the cars were screwed together by means of draw links. The shields were capable of moving vertically and laterally independently of the rods. The claim says "as these surfaces

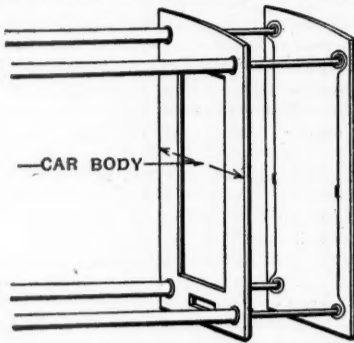


Fig. 3—Garvey's Buffer and Canopy Frame, 1852.

are covered with thick and strong felt they cohere sufficiently to prevent them from sliding over each other, while the shields possessing a mobility will remain in close contact with each other." There was therefore no frictional resistance between the frame plates.

In 1855 the United States granted a Mr. Atwood letters patent for a canopied platform, shown in fig. 4,

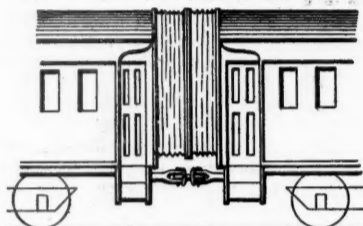


Fig. 4—Atwood's Covered Passageway, 1855.

which in external appearance closely resembles the vestibules of to-day. Its office was to inclose the passageway between the cars.

In 1864 one Dyer received a patent on an elevated buffer whose office, as described, was "to alter or change the line of concussion in order to lessen the tendency of carriages to overturn or rise on end in a collision."

Rock Chidley, in 1865, took a patent for an inclosure of the passageway between cars shown in fig. 5. The frame plate is attached rigidly to the car and supported by heavy iron rods. The hood is expanded by spiral springs which force a second frame plate into contact

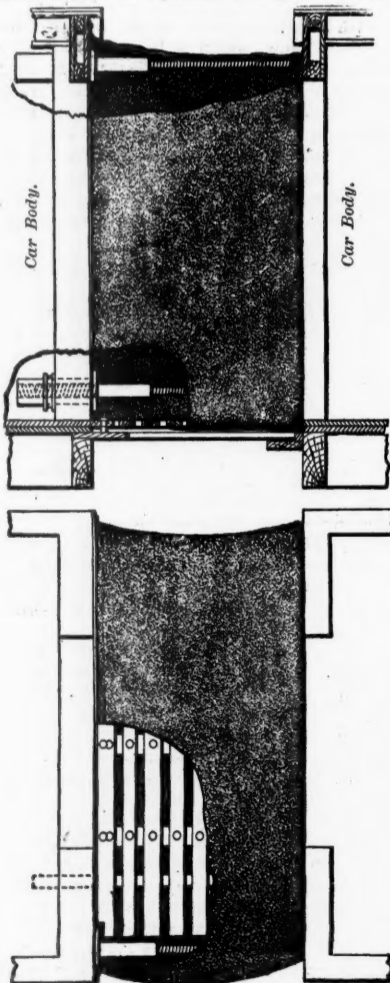


Fig. 5—Chidley's Covered-Passageway, 1865.

with the adjacent car. The device was provided with springs strong enough to expand the hood and to cause its face to bear against the adjacent car. In 1871 a patent was granted to Mr. Waller for a device, fig. 6, to

diminish the force of collisions by covering the entire ends of the cars with a sheet of rubber 1 in. thick, which was in turn covered with an iron plate  $\frac{3}{8}$  in.

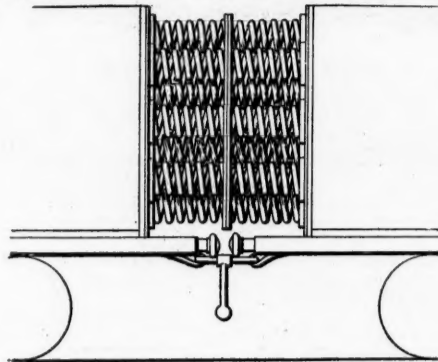


Fig. 6—Waller's Face-Plate Buffers, 1871.

thick provided with a number of rubber sockets 1 ft. square and 1 in. thick which received an equal number of springs (14), 2 ft. long when free. The outer ends of the springs were covered by a like plate, rubber sockets and sheet rubber. These cars when coupled had a bearing surface of 30 sq. ft. and the springs were reduced to 20 in. The object of this connection was to make the train a solid and flexible mass.

Previous to 1873 the Chicago, Burlington & Quincy used canopies over the platforms of its cars. These had iron rods 1 in. in diameter, inclosed by springs and attached rigidly to the tops of car bodies. Two of the rods supported one-half of the canopy frame or board, which was 1 in. or more thick, faced with an iron plate and hinged in the middle. The framework was forced out by springs, and when the cars were coupled the springs were compressed and the faces of the plated boards brought in contact. When this arrangement was brought up in the patent cases the Court characterized it as a rude device incapable of diminishing oscillation. Certainly it embodied the essential features of a modern vestibule.

Another platform canopy, very like the modern vestibule, was run by the Housatonic road in 1858 and 1859. This device consisted of a bellows connection of heavy canvas between the cars. The canvas was supported by bows of wood which were fastened together by thumb-screws. It was designed to secure a draft of air through the cars, to accomplish which wings were built out on both sides of the locomotive tender to collect the air which was carried over the baggage car into the first coach and from car to car. This was experimental and was abandoned after a short time, and was probably built after the Atwood design before mentioned. The Michigan Central and the Lake Shore & Michigan Southern roads also claim to have had cars about the same time equipped with platform canopies or hoods, kept together by spring pressure (*Railroad Gazette*, 1888, page 341).

In 1882 the United States granted a patent to C. S. Smith for an adjustable hood so constructed and attached to the ends of cars as "to afford ready and convenient means of passage from one car to the other without injury to the passengers." He used a number of bows instead of one, as did Bessemer. These he unites by cloth or thin material like the covering of a "prairie

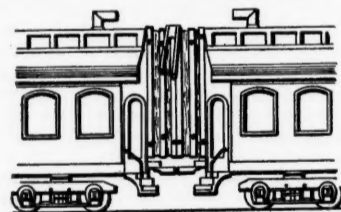


Fig. 7—Smith's Car-Platform Hood.

schooner." His forward or front bows came together to prevent the admission of cinders and dust and they were covered with packing. Fig. 7 is a cut of this hood. The only object mentioned was to exclude dust and cinders and to improve the ventilation. It was not designed to counteract or diminish lateral movement.

The objects to be attained by all of these earlier types were the same as the vestibules of to-day accomplish—but they had all been abandoned as impracticable or unnecessary except on the London & Northwestern of England, where a vestibule had been in use for some years on certain express trains.

It was not until 1887 that Mr. H. H. Sessions, under the favorable auspices of the Pullman Palace Car Company, introduced the vestibule, which became an essential part of a car. The competition between palace car companies and between the wealthier railroads to secure the patronage of an exacting and luxury-loving public had paved a way for their adoption. This public taste for extravagance coupled with the great resources and the superior mechanical skill of wealthy corporations produced a vestibule which at once became popular. The mechanical design was a great improvement over any of those earlier devices, and it was very soon adopted by the railroads throughout the country.

This universal adoption of the vestibule gave rise to

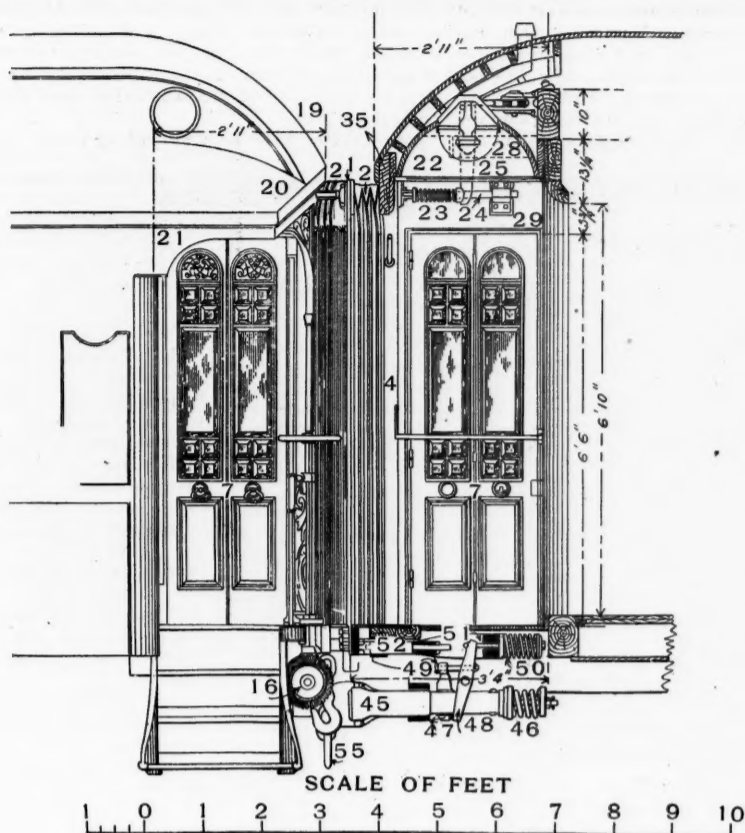


Fig. 8.

PULLMAN VESTIBULE (SESSIONS PATENT).

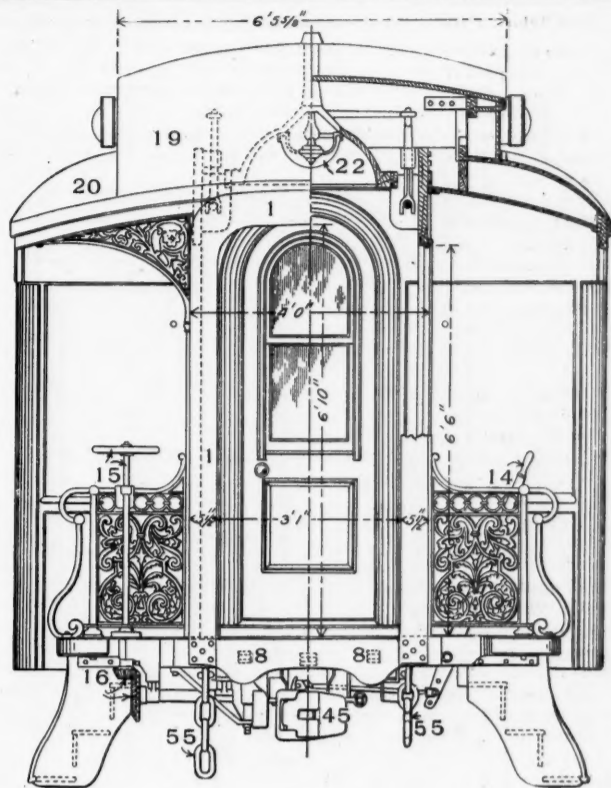


Fig. 9.

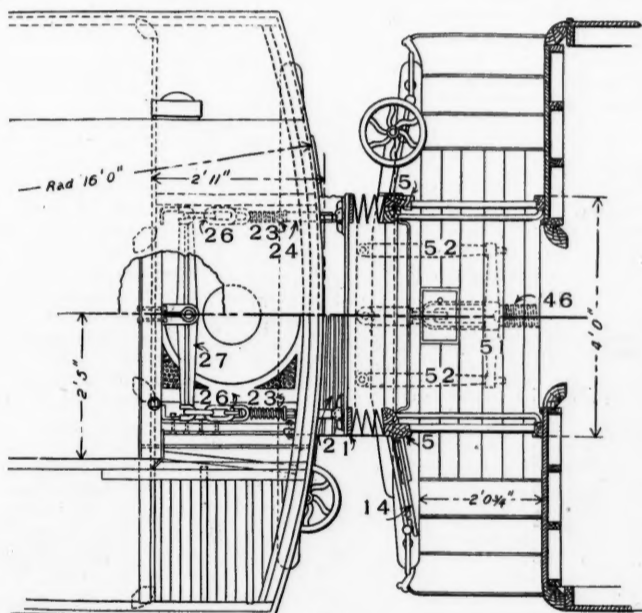


Fig. 10.

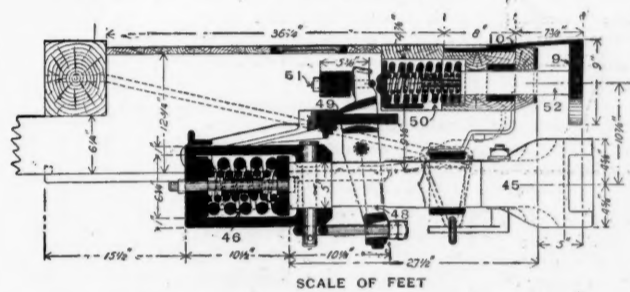


Fig. 11.—Pullman Vestibule: Buhoup Equalizer-Kicker.

suits for infringements of the patent rights which brought out the early history of the vestibule, as briefly outlined in this article. Three suits were prosecuted to the end and resulted in establishing the patent rights of certain features of the invention. The patent upon which the first suit was brought was No. 373,093 to H. H. Sessions, assignor to the Pullman Palace Car Company. The patent was filed April 29, 1887. It claimed the invention of "the combination with the end of a railway car of a frame plate or equivalent series of buffers backed by springs, arranged with its face in a vertical plane and normally projecting beyond the end of the car, whereby, upon the coupling of two cars a spring buffer will be interposed between the superstructures of such adjacent cars above their platforms, and also frictional surface opposing spring pressures to prevent the racking of the car frames upon sudden stoppages and to oppose the tendency of the cars to sway laterally [oscillate] when in motion," so arranged and adjusted that "when the two cars were coupled the faces of the buffers will bear against each other in contact under pressure."

The first suit was decided in February, 1888, by the United States District Court at Chicago, which is reported in 38 Federal Reporter, 416. After careful and exhaustive review of the whole subject, including those inventions and patents herein described, the Court upheld the validity of the patent on the grounds that "the device possessed patentable novelty and utility." The claims sustained were those of "frictional contact of the face plates under constantly opposing spring pressure, which diminished the shock to the superstructure in collisions and resisted the forces tending to create oscillation," which the Court said prior devices had lacked. One of the points covered in the specifications

declared that the use of the vestibule was old, for it had been in use for more than 20 years in England, Russia and the United States.

In reviewing the early types the Judge said of Mr. Symons' invention that the idea of being under spring pressure and preventing or diminishing oscillation was not suggested, but admitted that the prevention of oscillation was mentioned in his specifications, but said it was in connection with an improvement for the purpose of traction and propulsion. Mr. Garvey's invention, which had frame plates under spring pressure, and which was to accomplish "the dissipation of the shock in collision, and the diminishing of oscillation, and the reduction of the atmospheric resistance," and which had the hood or canopy, was distinguished by the fact that the frame plate was loose, while in the Sessions it is rigid, which is necessary to give frictional resistance. Of the device used upon the C., B. & Q., which bore the nearest likeness to the modern vestibule, the Court said that such an arrangement was "a rude device incapable of diminishing oscillation." It was abandoned after a short time. The Atwood, Dyer, and Smith patents did not cover the feature of diminishing oscillation under spring pressure. An injunction was granted against the defendants, who were using a vestibule which embodied the principle of the Sessions patent, viz., frictional resistance.

In April, 1889, the Chicago Court again declared the Sessions patent valid and made the temporary injunction perpetual.

Two weeks after the Sessions application was filed in the patent office, Mr. Pullman, of the Pullman Palace Car Company, made application for a patent whose specifications covered all the essential features of the vestibule. In his specifications Mr. Pullman claimed

the invention of the face or buffer plate connected with spring extended rod; the exclusive right to use a threshold or foot plate combined with the buffer rod or face plate; the bellows-like connection between the face plate and the car frame, and the side doors of the vestibule. Under claims of this patent Mr. Pullman brought suit in May, 1889, in the United States Circuit Court at Boston, and in October, 1890, obtained an injunction enjoining the defendant from using any of the above features of a vestibule. This practically gave Mr. Pullman complete control of all the vestibule's essential features. See 44 Fed. Rep., 195.

The success of this suit encouraged the third suit for an injunction in the United States Circuit Court at Chicago. It was refused Jan. 21, 1891, notwithstanding the very favorable decision of Judge Colt, of the Massachusetts Circuit Court. Judge Gresham held that the decision of the Circuit Court of Boston was inconsistent with a previous decision of the Illinois Circuit and that comity did not require him to issue an injunction on the strength of the Massachusetts decision. Another factor that had weight in this decree was that the testimony offered in this suit conflicted with what had been offered in the first suit. (See report in 44 Federal Reporter, p. 64.) The decision left the patent rights of the essential features of a vestibule in *statu quo*, but without any doubt but that the Sessions patent gives the Pullman company the exclusive right to use that form of vestibule with a rigid face plate under spring pressure and causing frictional resistance to lateral motion. The validity of patents upon all other essential features of the vestibule must depend upon the mechanism employed to accomplish the general functions named.

Many mechanical devices have been made to improve the vestibule. Foremost among them is Mr. Sessions' face plate equalizer, shown in figs. 8, 9 and 10. This device is intended to keep the upper part of the face plate thrust out and adjusted to its companion plate. It is shown in the hood and plan and the parts are numbered from 23 to 29 inclusive. Another most important adjustment of the vestibule face plate is the Buhoup vestibule equalizer-kicker, a mechanism forming a part of the Pullman vestibule. It is shown in figs. 8 and 10 and in more detail in fig. 11, and the parts are numbered 45 to 52. The object of this device is to have the bottom of the vestibule plate follow the movements of the draft rigging, and by a system of levers it is so arranged that whether the draw bar be in tension

or compression the bottom of the face plate and buffers are forced out, in the former case to prevent any opening between the two opposing face plates and in the latter case to aid in resisting the butting effect caused by sudden stops or collisions. Fig. 11 shows the mechanism in considerable detail, together with its dimensions. When there is a pull on the coupler (45) the spring

construction of a temporary structure to make a road around the old one, frequent interruptions of traffic, the employment of watchmen and additional inspectors and other expenses, of which the aggregate is considerable. An interesting way of avoiding such delays and expenses has just been adopted by the New York, Ontario & Western, on the recommendation of its Chief

traffic in any way. It is proposed to build outside of and inclose the present bridge by a heavier and wider structure. The towers of the new bridge will be outside of and intersecting those of the old one, and the present structure will be used for scaffolding upon which to build the new one.

Two schemes have been devised by which to erect

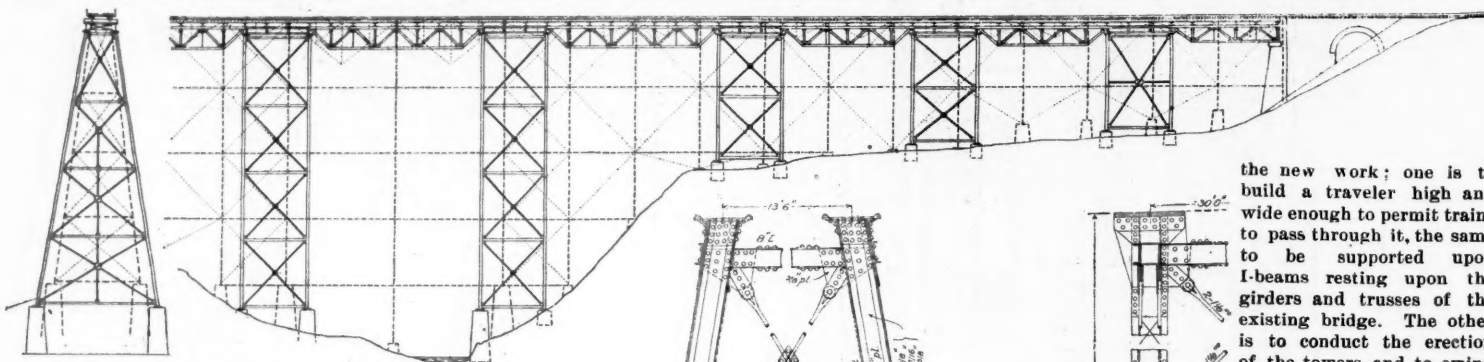


Fig. 1—Elevations of New and Old Structures.

(46) is compressed; the draw-bar horn (49) is forced against the combination yoke (48), which impinges against the buffer stem (52) and spring (50); when the coupler is under compression the spring (46) is compressed and the bolt below the bar is forced against the yoke (48) and forces out the buffer stem (52) as before. So that in case of collision the shock is met by the combined resistance of the drawbar and buffer springs, and in tension the buffer and face plates follow up any movements of the drawbar, thus insuring frictional contact and resistance at all times between the face plates of the cars coupled together. A Pullman vestibule equipped with these devices is shown in figs. 8, 9 and 10. The two sides of the face plate are equalized at the top by the face plate equalizing lever (27), fig. (10), and at the bottom by a platform equalizer (51), figs. 8 and 10. The face plates (1), diaphragm (2), post (5) and other essential parts need no explanation to those who are familiar with the usual type of vestibule.

Whatever conclusions the reader may have arrived at from the history and development of the vestibule to this time, 1891, it must be conceded that to the Pullman company belongs the credit for having introduced and perfected the vestibule. Whatever others had done prior to 1887 had been experimental and had been abandoned as impracticable. The Pullman company had patented and been to great expense to perfect its device and should not be blamed for trying to control it, to the exclusion of other railroad and car companies.

While these injunction suits were being prosecuted the mechanical talent of car and railroad companies was busy designing vestibules whose mechanism should avoid the patent claims of the Pullman com-

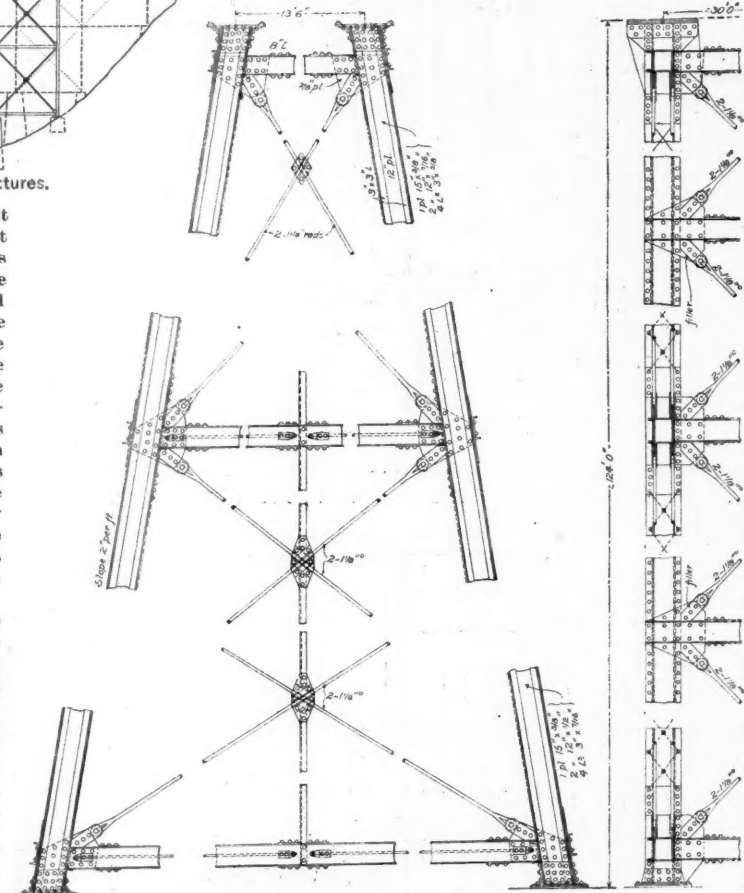


Fig. 2—Four-Story Piers, for Center Span.

the new work; one is to build a traveler high and wide enough to permit trains to pass through it, the same to be supported upon I-beams resting upon the girders and trusses of the existing bridge. The other is to conduct the erection of the towers, and to swing the girders from heavy derrick cars standing upon the present track, which cars can be side-tracked in the vicinity of the bridge during the passage of trains.

Fig. 1 of the accompanying engravings shows the new structure and an end section of the same, with the old viaduct drawn in dotted lines. After the new structure shall have been built to the full height and the girders have been lowered to the position it is the intention to slide through upon these girders I-beams which shall be about an inch below the bottom of the track stringer pieces to which the ties are bolted. When these I-beams shall have been put in place the track will be let down upon them, when it will rest upon the new structure and the old one be relieved, so that it may be taken down piecemeal.

Figs. 3 and 4 show the details of a tower and one of the 60-ft. trusses of the new structure. It will be

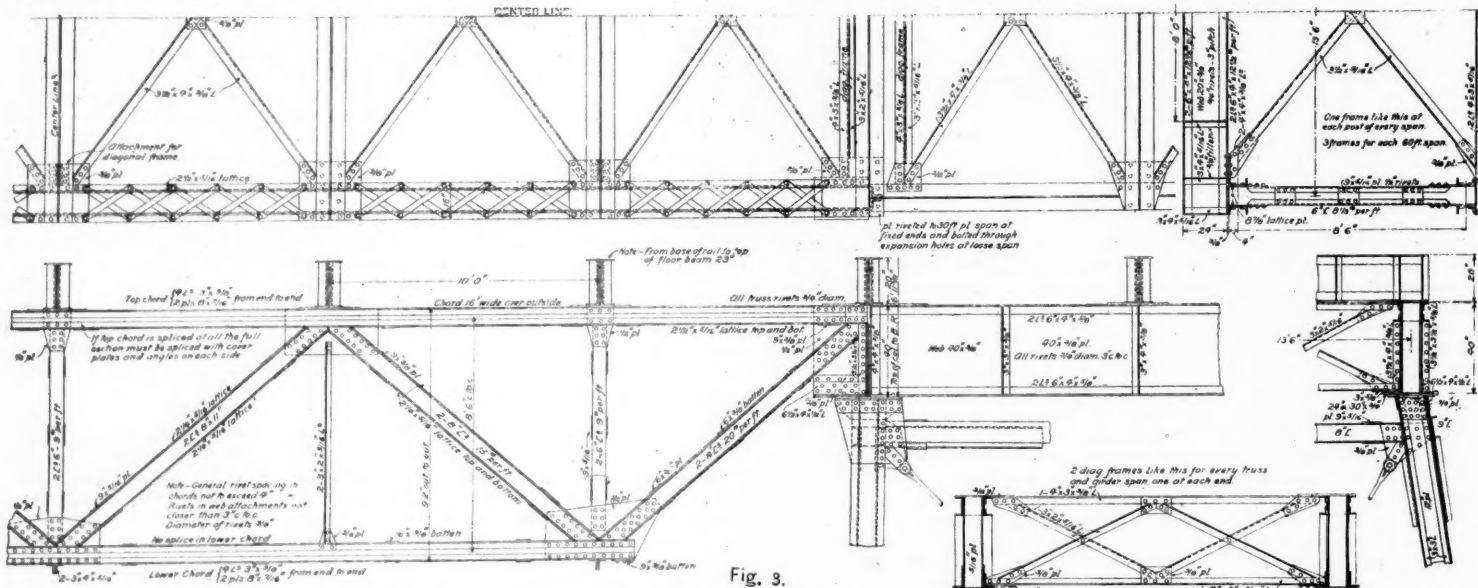


Fig. 3.

LYON BROOK BRIDGE, NEW YORK, ONTARIO & WESTERN RAILWAY.

Mr. E. CANFIELD, Chief Engineer.

Mr. ALBERT LUCIUS, Consulting Engineer.

pany. Two of these vestibules have come into general use, and their essential features and differences will be described.

(To be continued.)

Lyon Brook Bridge, New York, Ontario & Western.

Probably no place affords better opportunities for ingenuity in saving money than in the repair of heavy machinery or large structures. The first cost of a new structure can be estimated very closely, and the conditions attending its erection may be anticipated and provided for; but repair work is full of uncertainties. One of the expensive tasks in railroad construction is that of the renewal or alteration of tracks and bridges. The erection of a new bridge frequently necessitates the

Engineer, Mr. E. Canfield, in the reconstruction of what is known as the Lyon Brook viaduct, near Norwich, N. Y.

This viaduct is 166 ft. above the bed of the stream and 820 ft. long, and consists of square towers, with numerous short spans between, and one long span (100 ft.) over the creek. This structure was built in 1869 by Smith & Latrobe, of Baltimore, and is too light for the heavy rolling stock which the railroad now desires to use. The bridge has been strengthened once or twice to make it safe to carry the increased loads now permitted, but the speed of trains has to be slackened, and extra inspection and care are required, so that the road has determined to replace it by a new structure. The method proposed is one that is not intended shall interrupt

seen that the bridge is a riveted structure made up of angles and channels, and gusset plate connections to which the diagonal members are riveted or pinned. The new towers are built wider than the old ones to give greater lateral stiffness. The posts are built of plates, angles and channels latticed so as to permit inspection and painting, this having been preferred to the Z column.

The material is basic or acid open hearth steel, 60,000 lbs. tensile strength and 36,000 lbs. elastic limit, elongation 28 per cent. and not less than 45 per cent. reduction of area. No steel for tension members over 5/8 in. thick is to be punched; it must be drilled, and all other punched pieces over 5/8 in. thick must be reamed.

Two test pieces from each melt are to be bent cold

under the hammer until the ends close upon each other without cracking the outer fiber. Punched holes must permit cold drifting until they are expanded to  $1\frac{1}{2}$  times their original diameters without cracking the sides, and other similar tests are required. The specifications make provision for the selection of specimens, the rejection of material which does not stand the test satisfactorily and the usual other stipulations necessary to secure first-class material for such a structure.

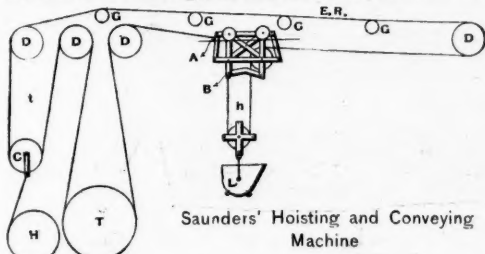
The contractor for this piece of work is the Pennsylvania Steel Company, and the price at which the work has been taken is extremely low. The masonry is to be completed by June 1, and the company is given two months in which to erect the bridge. The cost of the superstructure of the old viaduct was \$46,000, and that of the new one, which is much heavier and stronger, is much less; which fact is doubtless largely due to the study of the economy of construction explained, in making the designs. The bridge has been designed and will be erected under the direction and supervision of Mr. E. Canfield, Chief Engineer of the railroad, aided by Mr. Albert Lucius, C. E., as consulting engineer.

The Pennsylvania Steel Company has also the contracts to build for this road a steel viaduct in the place of what is now known as Humphrey's trestle, a wooden structure 800 ft. long and 40-45 ft. high, between New Berlin Junction and Guilford. The P. S. Co. has also been given the contract to erect a steel trestle 350 ft. long and about 40 ft. high in the place of an existing wooden structure located at Little Fall Creek between Summitville and Mountaineer. Both of these bridges will consist of steel towers similar to those illustrated in the Lyon Brook Viaduct, but the spans are plate girders instead of the triangular Warren type used at Lyon Brook.

#### Saunders' Hoisting and Conveying Machine.

A news item in our issue of Feb. 16 said that the Saunders hoisting and conveying machine would be used in the construction of a large sewer in the city of Cleveland. The rope system of this machine is very ingenious because only a single cable is used to do both the hoisting and conveying.

Referring to the illustration: One end of the cable is secured to the carriage, A, and the other end at B. The



circles lettered D in the cut represent guiding and supporting pulleys, or drums, which are fixed at any required height by suitable framework. The smaller sheaves, G, support the idle side of the cable. The drum, T, is the "traveling drum"; that is, when power is applied to this drum to revolve it in either direction the carriage is translated in a horizontal direction to the right or left, depending on the direction of rotation of the drum. The cable is given a sufficient number of turns around drum, T, to produce the resistance necessary to move the carriage. H is the hoisting drum; around it is wound a short rope, one end of which is secured to the drum, and the other end to the yoke of the pulley, C. The axle of pulley, C, is secured in guides which permit only a vertical movement. As the drum, H, is revolved in the direction to wind up the rope, the loop t of the main cable is lengthened, and therefore the loop h, between the load and the carriage, must be shortened an equal amount and the load L be raised. Rotation of the drum H in the opposite direction would lower the load. It will be understood from the above that the hoisting and translation in a horizontal direction may be done at the same time; the speed of either movement is entirely independent of the speed of the other.

Several machines constructed on this principle are now in use. They are made by the Saunders Hoisting & Conveying Company, of Cleveland.

#### The Safety of Compressed Gas.

[Translated from Glaser's Annalen.]

According to the unanimous opinion of the reporters and eye witnesses of the great railroad accident in Wammsee, only the small gas holder of the locomotive could be held responsible for the fire which broke out in connection with the accident, for the gas holder afterward showed a hole of about six square centimeters, and was at the time of the accident filled with gas under the pressure of four atmospheres. Now let us see what other facts were on hand at that time. The contents of said gas holder was 7 cu. ft., so that the quantity of free gas was  $4 \times 7 = 28$  cu. ft. The gas holder was fastened close to the firebox. All witnesses testified to having seen a flash of fire almost as high as a house when the locomotive ran into the car, and the quick judgment of the expert was that the large flame could only have been the result of a gas explosion. The experts of the Royal Ministry of Public Works, however, made an immediate and thorough investigation. Two gas holders of the same size as that destroyed were filled with gas under the same pressure, each having an opening as large as the hole in the destroyed gas holder, which openings were closed in such a way that they could be

unlocked instantly. At the first trial an iron coke basket filled with wood shavings was placed in front of the gas holder, about  $4\frac{1}{2}$  ft. from the closed opening; after the shavings had been set on fire, and while they were in full blaze, the lock was opened, but there was no flash. On the contrary, the burning of the shavings was temporarily stopped. The second experiment was made by placing the iron basket about 2 ft. from the opening, and had the same result. There was no burning at all, but the iron basket was upset by the high pressure. By this it can be taken as sufficiently proved that gas under high pressure is not inflammable at all, for the reason that the rapidly escaping gas takes a great deal of air with it.

The idea that the small quantity of 28 cu. ft. gas could have produced so large a flame as seen by the witnesses must be abandoned. If the sudden and explicable fright and terror were not the cause of a great exaggeration it must be supposed that the real cause of the large flash is to be looked for in the filling of chopped straw in the double bottom of the destroyed car. Through long years' use the chopped straw had been reduced to dust, which very likely may have caused an explosion.

As regards the latest great railroad accident in Milan, in which three heated locomotives collided, did not the burning coal furnish sufficient inflammatory matter for the cars which were lying beside and above them, and the woodwork of which, dry for long years, was thoroughly prepared for easy blazing?

Again, when, in 1891, a mail car near Apolda caught fire and burned down so quickly that the mail clerks had a very narrow escape, it was said that it was the fault of gas lighting. The mail car in question had been running for a couple of hours, the gas conduit and gas light was in good order, the mail parcels were piled up to the height of the gas lamps, when suddenly the mail parcels commenced burning with a strong flash, and the accident was ready. In order to prove that the gas lamps could not have caused the fire, an experiment was made by putting pieces of tissue paper and cotton in a lamp. These articles did not take fire. Gas under pressure and without admixture of air cannot explode at all. Gas used for lighting railroad cars, in consequence of its richness of carbon, is not capable of being easily inflamed, because the parts coming in contact with the flame are at once covered with a strong protecting layer of soot, as every traveler on railroads may easily observe, where the gaslight, instead of burning into the chimney, is thrown against the white reflector.

Lighting by gas has been proved and found reliable during more than 20 years. Sixty thousand conveyances are furnished with the same; and yet during that long period not a single fire on destroyed cars could be traced to the gas-lighting. Gas lighting, therefore, deserves the full confidence of the public.

Accidents by fire on railroad cars have happened before gaslight was used and will no doubt happen in future, and it would be only just to await the result of a careful and expert investigation in every single case before condemning the gaslight, which is well proved and reliable, and for which a substitute of equal worth in every respect does not exist so far.

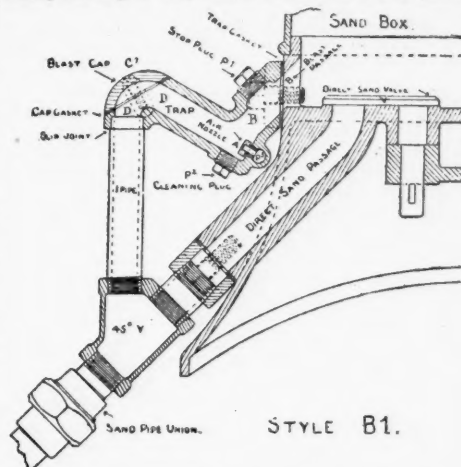
[Everybody has had a like experience in undertaking to light a gas jet with a match, placing the lighted match above the gas jet before turning on the gas or undertaking to light the gas jet by carrying the match directly in front and toward the jet, but no ever has considered that the experiment showed that the gas jet would not ignite nor that it would not flare up. The blowing of a blast of gas into the firebox of a locomotive is a very different thing from blowing it into a basket of light shavings. When the cock was opened the pressure of the escaping gas without doubt forced a column of air in front of it which impinged against the shavings and basket and may have blown it entirely over before any gas reached it. The moment that gas escapes into the atmosphere it will mingle with the oxygen of the air. If this mixture be blown into the furnace or against any flame of sufficient size and intensity to ignite the gas, there will be a flash and an explosion. Any one who has entered a room charged with gas and lighted a match has probably had an experience which will lead him to believe that it will burn. Torrents of gas are blown under great velocity into the furnaces of boilers and into stoves, and it is well known that they burn, and burn furiously. This does not prove that gas is dangerous for lighting passenger cars, because without doubt the inertia of the escaping gas or of the column of air which it would carry before it would blow out any lamps or chandeliers by which the car might be lighted. The experiment of putting tissue paper and cotton in a lamp cannot be discussed without knowing the character and shape of the lamp and the conditions under which these were placed. The idea that the gas used is so rich in carbon as not to be inflammable is hardly one that can be maintained. We can hardly imagine a gas being so rich in carbon and burning in the open air that it would cover itself with soot and without combustion. Lighting passenger cars by gas is a very safe method, and the lights are very comfortable; and the experiments show that the gas car lighting companies desire to ascertain the real dangers, if there be any, and how to meet them; but they should not try to prove too much.—EDITOR RAILROAD GAZETTE.]

#### Leach's Improved Track-Sanding Apparatus.

The original form of this apparatus, shown in the *Railroad Gazette* Aug. 26, 1892, had no provision for sanding the track profusely in case of emergency, and was generally condemned on that account. In the improved apparatus the usual sand-lever is retained, and may be used whenever desirable. The trap is bolted to the outside of the locomotive sandbox, where it may be readily got at for inspection and repairs. The trap receives its supply of sand through the independent passage "B" directly from the sandbox. By means of the air blast coming in through the nozzle "A" the sand is blown out of the trap through the passage "D" which connects with the sandpipe at Y. It will be seen that

the direct sand-valve V may be operated by the sand-lever in the usual manner. Another, and by far the most common form of trap, is bolted to the sandbox lug in the same manner that the sand-pipe flange is usually attached. The lug is extended to provide two openings from the sandbox to the trap, one for direct sending by means of the lever, and the other for the blast feed. Either form of trap is applicable to old as well as new sandboxes.

The compressed air for operating the device is taken from the main reservoir connections and is controlled by a feed valve properly constructed for light feeding, placed in the cab convenient to the engineer. For ordinary feeding a very small amount of air causes the

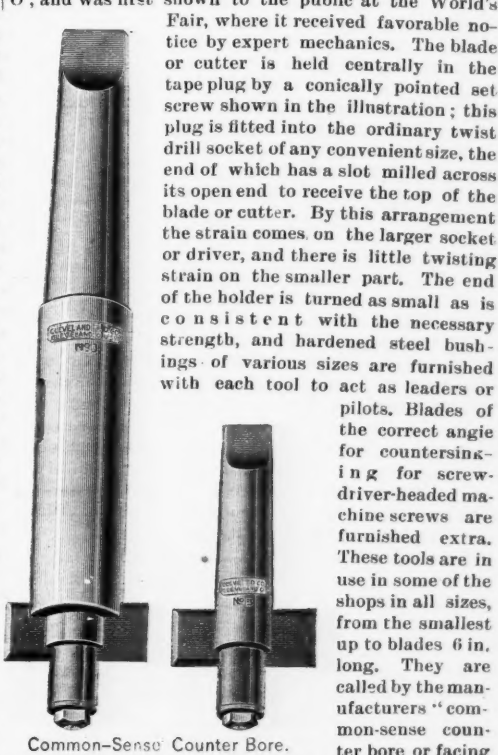


sand to "flow" upwardly through the passage D, and over the bridge of the trap. A plug P<sup>1</sup> is provided so that the flow of sand from the box may be stopped by a bit of waste placed in the passage B. The plug P<sup>2</sup> may then be taken out and the trap thoroughly cleaned of stones or other foreign substances. The cap C<sup>1</sup> receives the wear of the sand blast and may be cheaply replaced when worn out. By removing this cap, access is had to the blast nozzle "A," which may be taken out with a small socket wrench provided for the purpose. The simplicity of construction and operation, and convenience for inspection and repairs have been the causes of the success of this device, about 1,600 engines being now equipped. It is said to save more than one-half the amount of sand used by the ordinary sand lever arrangement. Waste of sand is of less consequence than the waste of power, tires and rails.

The patent on this improvement is dated Jan. 16, 1894, and is owned by Henry L. Leach, 70 Kilby Street, Boston.

#### Counter Bore and Facing Tools.

The counter bore or facing bar illustrated is a new tool, made by the Cleveland Twist Drill Co., Cleveland, O., and was first shown to the public at the World's



Fair, where it received favorable notice by expert mechanics. The blade or cutter is held centrally in the tape plug by a conically pointed set screw shown in the illustration; this plug is fitted into the ordinary twist drill socket of any convenient size, the end of which has a slot milled across its open end to receive the top of the blade or cutter. By this arrangement the strain comes on the larger socket or driver, and there is little twisting strain on the smaller part. The end of the holder is turned as small as is consistent with the necessary strength, and hardened steel bushings of various sizes are furnished with each tool to act as leaders or pilots. Blades of the correct angle for countersinking for screw-driver-headed machine screws are furnished extra. These tools are in use in some of the shops in all sizes, from the smallest up to blades 6 in. long. They are called by the manufacturers "common-sense counter bore or facing bars." The parts are made to standard jigs, and are carried in stock so that any piece can be duplicated.

#### Chicago Traffic News.

Cold weather throughout the West last week materially interrupted business in the interior, and country roads in many sections were still blocked. But despite the drawbacks the deliveries of grain at Chicago for the week by eleven leading Western railroads aggregated 3,400,000 bushels, against 3,280,000 bushels

the week ending Feb. 17, and 3,416,000, the week ending Feb. 25, 1893, and 3,825,000 bushels the corresponding period in 1892. The Western grain roads believe that their traffic from this until late in the spring will be very irregular, but they expect a good average business in live stock, except from Kansas, Oklahoma and northern Texas, where the recent cold blizzard caused large numbers of cattle to perish, but the loss in those sections will probably be made up from others. Speaking of live stock, the general manager of one of the big lines said: "If rates are maintained, the same number of cars will give the railroads more revenue the second quarter of the year than they received the corresponding time in either of the two years immediately preceding, because we now receive pay for a close approach to actual weight of stock, whereas by the old system of charging per carload shippers of heavy stock frequently got the advantage of the railroads, but under present regulations for weighing at the shipping point, and again here, and allowing for legitimate shrinkage in transit, the former irregularities are avoided." A feature in connection with cattle traffic is the growing competition between shippers on the hoof and the dressed beef establishments at leading Missouri River points. The latter are said to be steadily enlarging their slaughtering plants, therefore they are in a position to more sharply compete with shippers at Kansas City and Omaha for the cattle trade west of the river. An official of the Burlington said: "The dressed beef concerns are steadily increasing their business, and it looks as though the receipts of live cattle here had reached a maximum figure; in fact there has been no increase for several years. The arrivals here in 1893 were 350,000 head less than in 1890, while for the same time the receipts of dressed beef increase from 109,705,000 lbs. in the first mentioned year, to 178,982,000 in 1893." A prominent official of the Rock Island, speaking of the business, said: "The advantages given by the railroads to the dressed meat business has caused its rapid expansion, and there is a strong feeling that a considerable advance should be made for hauling refrigerator cars."

The following shows the deliveries of grain (bushels) at Chicago by the leading Western railroads for the week ending Feb. 24, and for the same time the two preceding years:

	1894.	1893.	1892.
C. & N. W.	1,057,000	782,000	530,000
Ill. Cent.	334,000	497,000	508,000
C., R. I. & P.	418,000	80,000	669,000
C., B. & Q.	665,000	1,069,000	650,000
C. & Alton	54,000	81,000	90,000
C. & E. Ill.	32,000	109,000	95,000
C., M. & St. P.	438,000	340,000	895,000
Wabash	91,000	38,000	134,000
C. & G. W.	152,000	155,000	150,000
A., T. & S. Fe.	121,000	325,000	101,000
L., N. A. & C.	8,000		
Totals	3,400,000	3,416,000	3,825,000

The deliveries of flour at Chicago by the leading Western railroads for the week ending Feb. 24, and the same time the two preceding years, compare as follows (barrels):

	1894.	1893.	1892.
C. & N. W.	16,503	39,432	35,534
Ill. Cent.	460	2,256	357
C., R. I. & P.	4,650	1,800	1,875
C., B. & Q.	6,796	20,923	9,755
C. & Alton	900	2,150	2,806
C. & E. Ill.		300	125
C., M. & St. P.	18,450	34,200	26,425
Wabash	600	1,350	1,325
C. & G. W.	17,278	12,477	12,327
A., T. & S. Fe.		1,050	
L., N. A. & C.			352
Total	65,627	115,932	90,971

The movement of merchandise and miscellaneous freight to the interior was larger than for any week since the opening of the year. The heavy shrinkage in coal and lumber traffic compared with the same time last year was very disappointing. The decreased traffic from here is largely due to low rates obtained direct from the soft coal mines east and southeast of Chicago over cross country roads direct to consuming points. It is possible that some of the loss in coal out of Chicago is made up by an increase in the interior.

#### The Protection of Ties.

Mr. Benjamin Reece, well known to the readers of the *Railroad Gazette* as the indefatigable champion of the Servis tie plate, sends us two photographs of ties which have enjoyed the protection of such plates during the later portion of their existence; and he draws some interesting lessons from them, which we can only print in part, selecting such passages as bear more particularly upon the track discussions which have recently appeared in these columns.

The oak tie shown in fig. 1 was taken from the track of the Jeffersonville, Madison & Indianapolis Railway bridge over the Ohio River at Louisville, after ten years' service on a 78-ft. grade. This tie for six years had no protection and, with others, was marked for removal because of cutting in of rail flanges. The ties being sound, it was concluded to try the Servis tie plates and keep them in place. During the four years' use of the plates no work has been done upon the track, whereas,

prior to that time, three carpenters were almost constantly engaged in shimming, lining and correcting the gage.\*

In the spring of 1893, a number of ties were found to be rotting away, but the plates were still affording ample support to the rail. Such ties were removed, with the exception of the tie above photographed, which was suffered to remain for an experiment, and was removed in November, 1893, in the condition shown, and to the day of its removal it carried 150 trains a day without the slightest movement of the plate. The tie speaks for itself and shows very clearly the compacting and compression of the wood fiber between the longitudinal flanges, excluding moisture, making the plate integral with the tie and indicates why this form of plate cannot rattle, and why the labor of repairs is so much reduced. The black ridge on the left hand side of the plate is the oil and dirt accumulation caked to the plate. A similar ridge on the opposite end of the plate was scraped clean by the rail flanges when the tie was drawn out from under the rail.

Fig. 2 shows two specimen yellow pine ties from a large number removed from the Manhattan Elevated tracks in January, 1894. These ties had been less than six years in the track, and had to be removed because of decay due to the effects of moisture under the flatbottom tie plates used to protect the ties from the cutting action of the rail flanges. The photograph presents two ties which were selected to show the extreme of condition observed. In the upper tie the rot extended to the sap wood beyond the plate, as shown. The lower of the two ties had remained in the track five years and three months. When removed, being a heart tie, the rot was

In Europe, bolt fastenings with tie-plate supports for the rail are in very general use, but even this combination does not suffice to prevent the movements described, hence the development of the Harman Victor system of track described by Mr. Charles Paine in your issue of Nov. 3, 1893. The basis of this system is a high wide-based rail designed to afford great stiffness so as to extend the range of the distribution of the pressure sustained by it.

In conference with many European engineers who visited this country during the World's Columbian Exposition, I learned that, even with tie-plate supports, bolt and screw fastenings of T rails are required to be tightened at intervals of a few months.

The functions of tie plates are becoming better understood with us, and many who have used them have come to realize that the chief economy of their use resides in the fact that they mechanically restrict, and thereby prevent, the cumulative effects of the first or necessary movements of the rails subjected to given strains; hence by their use a great saving is secured in ties, rails and labor; or, where section forces are not reduced, a more perfect condition of track is secured without added cost. The same thing is true of heavier and stiffer section rails.

In prescribing that tie plates must be securely fastened to the tie Mr. Clarke undoubtedly had in mind the rotting of ties under loose plates, as shown in fig. 2, also the clatter and hammering of rail and plate where the latter loosens and jumps under the train with the passage of every wheel. As shown by European experience, the fastening of tie plates to the tie with bolts does not entirely prevent the evils mentioned, although



Fig. 1—Oak Tie; Ten Years' Service.

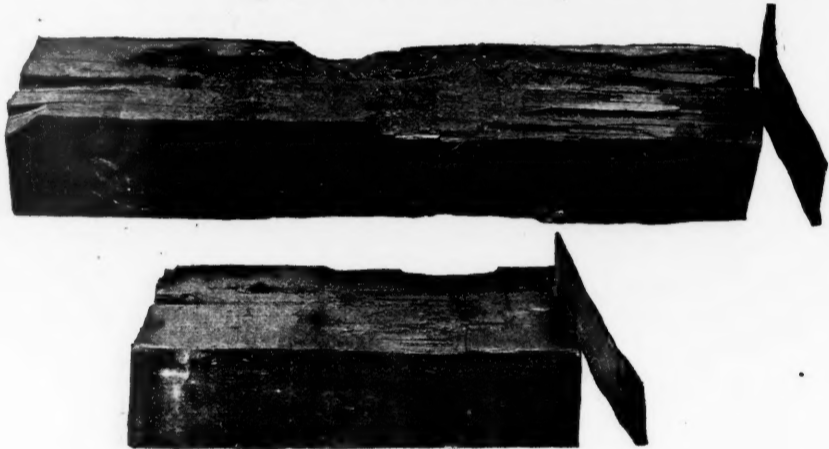


Fig. 2—Yellow Pine Ties from Manhattan Elevated.

found confined to the portions of the tie covered by the tie plates, the remainder of the tie being still sound.

To protect the ties of this road against the cutting action of the rails, some 6 in. x 8 in. x 1/4-in. plates were applied in 1888. These plates, in addition to buckling and cracking at the ends as shown in illustration, induced premature decay of the portion of the ties which they covered.

These plates perfecting no union with the ties jumped and rattled under the rail; the section produced by the jumping plates drew the moisture into the depression which the moving plates had worn into them, the jumping plate literally pumping water into the ties. In less than six years the ties were removed because of this rotting away under the tie plates, the very part of the tie where soundness is most required to securely hold the fastenings and give support to the rail.

In 1889 the Manhattan Elevated commenced to apply the longitudinal flanges or service tie plates shown in fig. 1, which have not only protected them against the cutting action of the rail but have preserved them against premature decay. Where the ties above shown are being removed others with the service or longitudinal flanged plates are being substituted.

Unless the rail is sufficiently stiff to carry its load at the speed required without deflection, neither the screw with clip fastenings illustrated by Mr. Walter Katte, of the New York Central, in your issue of Feb. 2, nor the electric welding of the rail to tie plates fastened to the tie with four bolts, as advocated by Mr. T. C. Clarke in your issue of Nov. 17, 1893, will suffice to prevent the uplift of the rail. Such fastenings may seemingly hold the rail to the ties, but only at the expense of pumping the tie in the ballast, with the resulting loosening and wear of parts.

\* For further information or verification reference is made to Mr. J. C. Cox, of the Louisville Bridge, Louisville, Ky.  
† For verification and further information reference is made to Mr. Robert Black, Road Master, Manhattan Elevated.

it measurably reduces them. The plates being tightly secured to the tie by bolts, with the passage of the first train they begin to loosen, so in a few months, at farthest, considerable play is allowed, and the resulting evils will be in an inverse ratio to the alertness exercised by trackmen in keeping them securely tightened.

The longitudinal flanged plates shown in fig. 1 automatically perfects and preserves their union with the ties, the more the traffic the tighter the plates, as strikingly shown in the illustration.

#### Lake Shore Witnesses Excused from Testifying.

The investigation before the Federal Grand Jury at Chicago, in which the attorneys of the Interstate Commerce Commission sought to get evidence of illegal rate cutting on the Lake Shore & Michigan Southern and other roads, was reported in the *Railroad Gazette* last week. On Feb. 26 Judge Grosscup handed down a decision holding that the witnesses were right in refusing to answer questions before the Grand Jury, claiming the protection of the Constitutional privilege; that Congress did not and cannot pass an act exempting any one from the operation of the constitutional amendment. He discharged the rule compelling James and McLeod to testify. This decision effectually bars all prosecutions in the Northern District of Illinois, and it is not likely, in view of the Counselman decision and this decision, that the Interstate Commerce Commission will attempt any further proceedings, but will turn its attention toward another amendment to the law. The attorney representing the Commission stated that the cases at Chicago would be dropped.

The decision in substance is as follows:

Every man's life is, so far as society is interested, a series of personal acts. A known act in a person's life is made the beginning of the tribunal's work of unraveling, and though apparently remote from the actual criminal deed, is so linked therewith that the judicial following out of the intervening thread will eventually bring out the full disclosure of the criminal act. The

disclosure of such a remote act is, therefore, indirectly but effectually a disclosure of the criminal act itself. Since the Counselman case, it is admitted law that every person is protected by the Fifth Amendment against self-disclosures in any proceeding, civil or criminal, of such of his own acts as would subject either the actor or any connected with him to the dangers of incrimination. The constitutional guarantee puts a seal upon his personal knowledge that no legislative or judicial hand can break. The Judge says:

What was the real purpose of the Fifth Amendment? Did it intend to guarantee immunity thereby against compulsory self-accusation of crime so far as it might bring to the witness law-inflicted pains and penalties? Or was it to make the secrets of memory, so far as they brought one's former acts within the definitions of crime, inviolate as against judicial probe or disclosure? The Counselman case leaves this question undecided. So far as the Supreme Court of the United States is concerned I regard the opinion as an open one.

The case at bar inspires no wish in the Court to protect the witnesses. The Interstate Commerce act is a law of the land, and the witnesses ask for protection under the amendment under circumstances which in the case that, having violated it before, they had no intention to cease violating it now. It is the contest of people who disbelieve in the expediency of the law against the attempt to enforce it. Judged by this specific instance, the Fifth Amendment, if construed broadly enough to afford the witnesses immunity against testifying, is an obstruction in the path of the administration of law.

In my opinion, the privilege of silence against a criminal accusation guaranteed by the Fifth Amendment was meant to extend to all the consequences of disclosure.

The defectiveness of the statute of Feb. 11, 1893, might well be questioned on other ground. It is a statute of pardon. Until the witness makes his disclosure he is chargeable with the offence without his personal knowledge. The pardon becomes effective only at the moment and upon condition of disclosure. But pardon is not necessarily unilateral. No person is compelled to accept the legislative or executive grace.

In the case at bar it must be assumed that the witness is guilty of some offence. In the absence of the statute of Feb. 11, 1893, he has the undoubted constitutional right of silence. It is said that that right is taken away by the immunity of pardon extended by the statute. But he chooses not to accept such immunity, or pardon. He prefers to stand upon his constitutional rights, and take his chances of conviction, rather than expose himself to the civil liabilities and the odium of self-confessed crime.

#### Illinois Railroad Inspectors' Report.

Messrs. R. P. Morgan & Son, the engineers of the Illinois State Railroad & Warehouse Commission, have made their report, to be incorporated in the annual report of the commission which will soon be issued. A copy of the engineers' report has been sent to us, from which it appears that Messrs. Morgan have done a good service for the state, making a general inspection of the physical condition of all the railroads, though their report does not contain detailed facts concerning each road, like the inspector's report in New York state. Their inspection occupied four months, or from Aug. 1 to Dec. 6. The roads furnished them with quite full engineers' notes before they started, thus greatly facilitating their work. Reference is made to the roads which have been complained of as dangerous. Some of these have been referred to heretofore in the *Railroad Gazette*, and the special report of the engineers on them is merely referred to here. In several cases "immediate improvement was found necessary" and orders to that effect were complied with by the roads interested.

It is found that the roads in the northern part of the state have good ballast because gravel is abundant there, while in the southern part gravel is scarce, but sleepers are cheaper, so that the differences in condition partially offset each other. The length of railroads in Illinois now is 10,427 miles, of which 94 per cent. is laid with steel rails, 55 per cent. well ballasted and a considerable percentage in addition is partially ballasted.

The condition of signal structures, crossing signs, mile posts, etc., is found so shabby that sharp emphasis is laid on the necessity of taking more energetic measures to punish the malicious and mischievous defacement and destruction of such property. On some roads it is only with the greatest difficulty that the officers keep these fixtures in good order. The natural life of posts, outdoor signs, etc., is 10 or 12 years, but as a rule they have to be renewed every two or three years. The letter of a prominent railroad manager is quoted in which it is said that both repair men and detectives are kept busy on this matter. This manager has arrested 18 offenders in Illinois during the past year, for interfering with block signals, and he thinks there are many more who ought to be arrested.

The engineers discuss and commend block signaling. There are now over 400 miles of track (not miles of road) in Illinois equipped with block signals, and besides this there is a large mileage on which trains are blocked a station apart by the regular telegraph operators. Block signal apparatus is contemplated on 900 miles of track in the immediate future. The following statistics are given:

#### Block Signals in Illinois.

Style of signal.	Road.	No. of blocks.	Miles of track.
Hall.....	C. & N. W.....	206	180
	I. C.....	138	91
	C. & B. & Q.....	17	10
Westinghouse elec- tro-pneumatic.....	C. & N. P.....	26	10
	C. & N. W.....	38	18
	C. & B. & Q.....	72	16
	C. & W. L.....	16	12
Manual.....	C. & C., C. & St. L., St. Louis Div.....	18	18
		429	

To the 106 miles shown in the last three items should be added the large mileage blocked by telegraph operators, but it has been impossible to obtain complete information as to this mileage.

Laws requiring interlocked signals at crossings of one railroad with another were passed in Illinois in 1887 and 1891, and considerable progress has resulted. The engineers have held conferences with the chief engineers of railroads during the past year, with a view to revising the rules of the state concerning interlocking. Among the new rules adopted is one under which railroads present their plans for interlocking to the Commission previous to the commencement of work. The interlocking devices approved by the Commission are tabulated as follows:

Year approved.	No. of plants.	No. of working levers.
1889	7	65
1890	16	185
1891	8	145
1892	23	418
1893	39	1,182
Total.....	93	1,997

Eleven interlocking plants were reconstructed in 1893 and their capacity enlarged 110 levers. Many of these interlocking plants are at terminals and other places where the law does not require them, showing that the railroads fully appreciate the value of interlocking, aside from the action of the state. Plans have been approved for numerous interlocking machines to be constructed during the coming year, among which is one larger than any now in use in the state.

#### Rate of Combustion as Affecting Evaporation in Locomotive Boilers.\*

In some sections of the United States there are large amounts of fine coal and slack that cannot be burned in the ordinary locomotive; and in such places here, as in Belgium, one finds a peculiar construction of locomotive fireboxes. In this country the most common type for fine coal is the Wooten. A new form, having a Belpaire top, has been proposed. It is not unlike that used in Belgium. The Wooten type of boiler has been

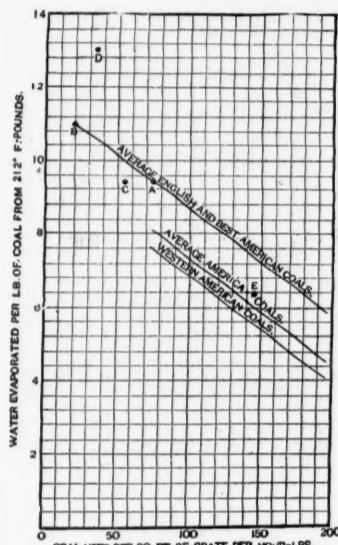


Fig. 1.

NOTE—A to B = English practice.  
C = English coal as determined by Rankin.  
D = English coal as determined by Kennedy and Donkin shop tests of a locomotive.  
E = American coal—Brazil block—Indiana—Goss, at Purdue University shop tests.

very successful where there is a sufficient quantity of fine coal; but on some Western roads in the United States, where it has been tried, there has not been enough fuel to keep the engines supplied. Add this to the disadvantage of having to keep in stock two classes of fuel for engines at the same terminal, and the difficulties experienced with the large crown sheets, and the reasons are found for the infrequency of this type of firebox. . . . An increase in grate area, which is, of course, followed by a decrease in the rate of combustion of coal per square foot of grate per hour, is conducive to economy; but there is a limit to this increase, which cannot be exceeded without loss from incomplete combustion and excess of air supply through the grates. Large grates are difficult to cover properly, and if the fuel is free burning it is impossible to regulate the fire accurately, and much heat is lost by the blowing of the safety valves when the train is at a station or while descending grades.

The forcing of American locomotives, which results from the necessary policy of hauling heavy trainloads, is perhaps best illustrated by fig. 1, which shows the decrease of the evaporation of water per pound of coal in a locomotive boiler which accompanies an increase in the coal "used" per square foot of grate per hour. The term "used" is perhaps better than "burned," because much of the coal that is thrown into a locomotive firebox is not burned, but goes through the tubes in the form of cinder and smoke. This diagram is taken from many results obtained within the last three years on American railroads, during locomotive tests, where the coal used per square foot of grate per hour has varied from about 60 to nearly 200 lbs. That there is the marked decrease in evaporation accompanying an increase in the rate of coal used that is shown by the diagram is becoming well known here, and has recently led to a stronger conviction about the advantage of using large grate areas. In some recent tests of three locomotives, having different areas, it was found that

\* Extract from a paper by D. L. Barnes on "Distinctive Features and Advantages of American Locomotive Practice," before Civil Engineering Section World's Engineering Congress, August, 1893.

the coal used per square foot of grate varied almost in an inverse proportion to the total area of the grates, and the water evaporated per pound of coal decreased with the increase of coal used almost exactly as shown on the diagram. This led to the conclusion at the time that the larger grate that could be put on a locomotive the greater would be the evaporation per pound of coal used, provided always that the grate does not exceed in size that which can be properly handled by the firemen. In some cases we have made the grates too large, but as a rule a good fireman can properly fire a furnace with a grate not exceeding 10½ ft. in length, and up to this length it is practicable to go. On roads where a deep firebox with a comparatively small grate has been used for a long time, the firemen object strongly to the introduction of a shallow firebox and a larger grate, as it requires more skill and attention.

On the coal diagram, there are three lines—one showing the evaporative power of Western American coal, such as is commonly used in the vicinity of Chicago and farther west; the next line gives a fair average of the coal used throughout the United States; the upper line shows the better quality of the best American and the average English coal. Perhaps the difference in the English and American coals is better illustrated by the points representing individual tests by Kennedy and Donkin, and the results obtained by Mr. Webb with the compound locomotive "Greater Britain." These points are considerably above the highest results from American locomotives using the best American coal (see the result obtained by Professor Goss during the Purdue University shop tests of a locomotive). The continuation of the upper line on the diagram from A to B illustrates the difference in the way in which locomotives are worked here and in foreign countries. It is not common, except in the United States, to use over 70 lbs. of coal per square foot of grate per hour. The difference between the evaporation per pound of coal used from A to B and that given on the line representing the average American coal, shows how much greater is the efficiency of boilers operated without forcing than under the American plan of operation. The average evaporation per pound of coal used throughout the United States is not over 5½ lbs. of water from and at 212 deg., while that in foreign countries, when operated between the limits A and B on the diagram, and which is taken to be the average work, is nearly 10 lbs. These figures correspond to a considerable difference in coal used per square foot of grate per hour; namely, 150 lbs. for the American and about 50 for the foreign.

There is such a wide difference in the evaporating power of the coals found in various parts of the earth that a comparison of the performance of locomotives using different fuels is well-nigh impossible without a full knowledge of the chemical composition of the fuel used and a practical knowledge of its mechanical action in a locomotive firebox. Coals having much moisture and a large percentage of ash made up of fusible silicates do not give results in evaporation that would be expected from an examination of the chemical composition; and coals having the same percentage of hydrogen, carbon, oxygen, etc., do not necessarily give the same results in evaporation; hence, a practical knowledge of the value of various fuels in locomotive boilers is absolutely necessary before a fair comparison can be made of the relative performance of different engines under otherwise equal conditions.

The varieties of coal in common use and the wide difference in composition may be seen from Table C, but, unfortunately, the real value of the fuels in practical operation cannot be learned from this table, owing to the lack of data recorded by the different experimenters. What is lacking is the real evaporative power of the fuel under equal conditions, and there is much merit in the proposition recently made by one of our engineering societies, to establish a central testing station, with a standard boiler operated under standard conditions, for the purpose of determining the relative value of various fuels.

Perhaps fig. 1 illustrates as well as need be the reason for the greater economy of foreign locomotives under the conditions of average operations. Of course, if the foreign engines were to be forced so much that the coal used per square foot of grate would increase from 50 to 150, the evaporation would drop from 10 to 7½; and if the coal used on English engines were no better than that used here, the evaporation would certainly drop to less than 6 lbs. of water per pound of coal, the same as for the American locomotive. Although there is evidently a waste of coal on the American plan of operating locomotives, yet, as has been shown, there is a gain by doing this. Perhaps the following approximate estimate made up for such accurate data as is now available will give a sufficiently close comparison of the coal used in the best foreign and the best American passenger train service, average coal being taken in both cases:

Country.	Total train weight, tons.	Coal per ton-mile of total train.	Coal used per ton of grate, per hour.	Water evaporated per pound of coal from 212° Fahr.	Coal per ton-mile of passenger cars.
Foreign.....	220	.12 lbs.	60 lbs.	9½ lbs.	.182 lbs.
United States.....	400	.15 "	110 "	6½ "	.191 "

This comparison shows how little is the difference in the weight of coal used per useful ton-mile here and abroad, under about the same conditions even when no allowance is made for the difference in the quality of the coal. What this difference in quality amounts to can be seen by an inspection of fig. 1, on which lines are drawn for the average American and average English coals. With the same coal for both typical locomotives, the American practice of heavy train loads would result in less coal per useful ton-mile. In the United States, wages and train expenses other than for coal are so comparatively great as to leave no choice in train practice, and railroads are compelled to condense the passenger traffic into heavily loaded passenger trains run at long intervals in order to pay expenses. There are a few cases here where lighter trains than the average can be run with profit, such as between New York City and Philadelphia; but even there the trains must be heavier than the average foreign train, as more passengers must be carried per train to pay the greater cost of wages and other train expenses. Where parlor and sleeping cars are run, the greater weight of train per passenger also causes heavier train loads.

There are many other conditions in this country that compel heavy passenger as well as heavy freight trains, and particularly is this true for through trains where the distances are long and the trains cannot be run fre



amount necessary to keep the level of fuel in the charging hopper constant during the test.

Feed water was taken from a surface condenser.

**Seventh Test.**—This test was made with a boiler of the portable type belonging to a traction engine (see fig. 7). The following are its principal dimensions: Inside length of firebox, 39 in.; width, 34½ in.; height, 37 in.; cylindrical part, diameter, 35½ in.; number of tubes, 50; diameter of tubes, 2.4 in.; of smokestack, 13 in.; natural draft was used produced by a smokestack 39.4 ft. high and regulated by openings in the ashpit door. Firing was frequently done with small amounts of fuel. The results of test are shown in column 7 of the table.

**Eighth Test.**—Made with a type of boiler (see fig. 8), commonly known as the Elephant boiler in France but so little used in England that Messrs. Bryan & Donkin preferred to take the results of a test of one of these boilers in their shop in Thann, made by Mr. Scheurer Kutner. In order that the test be strictly comparative the same kind of coal as used in the other tests was shipped from England in weighed sacks and used throughout this test. The boiler was of plate iron; the following are the principal dimensions: Length of upper cylinder, 23 ft. 7½ in.; diameter of upper cylinder, 47½ in.; length of lower cylinder, 25 ft. 9½ in.; diameter of lower cylinder, 19½ in.; total heating surface, 430 sq. ft. This boiler was fed through a large heater which ordinarily served two boilers and contained 1,033 sq. ft. of heating surface. During the test it was used for this boiler only. The results (see table) show the use of the heater increased the total efficiency of the boiler 13 per cent. This test was continued longer than any other which should insure greater accuracy.

**Ninth and Tenth Tests.**—These tests were made with a small six-wheel coupled locomotive of the Great Eastern Railway used for switching near stations (see fig. 9). It is to be regretted that the tests were not made with a more powerful express engine in ordinary service. The evaporation of this boiler per pound of fuel is very high and there is no doubt water was entrained. The priming should not be much, however, as the boiler was not forced and was far from giving its maximum evaporative power.

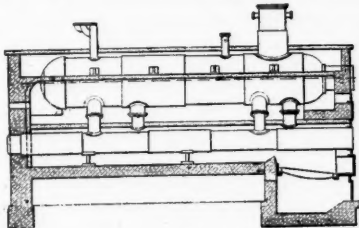


Fig. 8.

The following are the principal dimensions: Heating surface in firebox, 78 sq. ft.; of tubes, 781 sq. ft.—total, 859 sq. ft.; grate surface, 12.5 sq. ft.; number of tubes, 223; length of tubes, 9½ ft.; diameter of cylinder, 16½ in.; stroke of piston, 22 in.

Two tests were made of this boiler. 1st, with the engine blocked up in the machine shop, the wheels coupled to the shafting. The draft was produced by the exhaust as usual and the feed water was measured by means of two gaged tanks. During this test a number of indicator diagrams were taken. The test was continued for eight hours and the following day the amount of heat lost by radiation at the same steam pressure was determined. Column 9 of the table gives the results of this test. 2d, with the engine on the road drawing a train of 263 tons at moderate speed. Water was carried in a special tender attached to the engine which was weighed before and after test in order to verify the amount of water consumed. A large number of indicator diagrams were taken en route, which showed the engine developed an average of 137 H. P. The steam used per horse power was on the average 29.99 lbs. for an average speed of 141 revolutions with boiler pressure of 120 lbs. If the figures shown in the table be taken as correct the locomotive boiler is more economical than the best types of stationary boilers even with a feedwater heater utilizing part of the heat in the gases otherwise wasted. It is, however, probable that there was considerable water entrained with the steam from the locomotive boiler, as well as from the boiler given in columns 4 and 6. However this may be, the results here given form, taken together, a collection of data which enable us to compare with some accuracy the principal types of boilers now commonly used in European practice. It must be remembered, however, that the fuel employed was coal of the best quality, averaging only from three to six per cent. of ash.

#### The Relations of Railroads to the Public.

##### DISCUSSION AT THE CHICAGO COMMERCIAL CLUB.

"The Benefits of the Interstate Commerce Law to the Business Interests of the Country" was the topic before the Commercial Club in Chicago on the evening of Feb. 24. The principal speakers were Mr. H. H. Porter, President of the Chicago & Eastern Illinois; Hon. Aldace F. Walker, Prof. A. T. Hadley, of Yale, and Mr. George R. Blanchard, Chairman of the Central Traffic Association. We have space only for brief extracts from the ad-

resses. One of the most novel presentations of "the railroad problem" was that by Mr. Porter, who was the first speaker. He said, in part:

I assume that by the "business interests of the country" is intended the whole interests of commerce, manufactures, transportation and the people, and that these benefits mean, under proper business management, a fair remuneration to investors, producers, transporters and the interested public generally, and favoring no one interest against another. Under the various state laws and the inter-state commerce law this can hardly be said to be the condition now. How much of the present dissatisfaction is attributable to the inter-state commerce law, and how much to other conditions, I will not discuss. But to my mind the railroad problem can be worked out, and successfully worked out, as thought transportation has been.

The application of steam and the application of electricity came about the same time. Companies were organized for the construction of railroads, and at about the same time were organized for the construction of telegraph lines, and so fast as a railroad was built a telegraph line was built on the same right of way. They were each used for similar purposes—the railroads to transport passengers and property, the telegraph line to transport thought, and their methods were alike in principle. The fear of monopoly and the fear of the power to be executed by the growth through combination of telegraph lines was the same as the fear from railroad growth and combination. The telegraph manipulation being the less important, the legislation of the various states and of the general government to prevent these combinations by the railroad companies was greater than the legislation to prevent these combinations by the telegraph companies. But telegraph companies were organized to build connecting and competing lines exactly on the same principle as railroads were. Prices of the different companies were different from one common point to another, exactly as the railroads were. Large expenses were incurred in carrying on competition, and the corporations were as generally on the verge of bankruptcy as the railroad companies now are. But, fortunately, laws were not passed to prevent their amalgamating, and hence their different condition to day. A few years ago there were any number of telegraph corporations in the United States. Some allies, some competitors; all quarrelling; rates were unsteady. New companies were

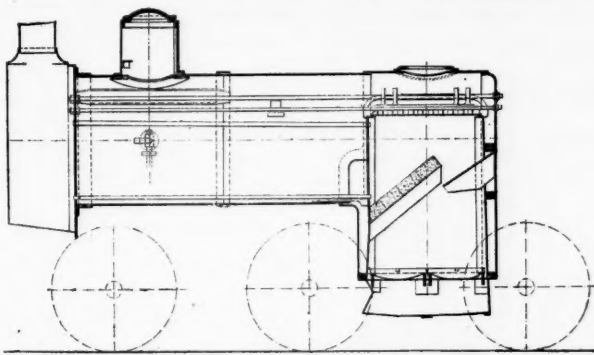


Fig. 9.

being constantly organized; some with a legitimate purpose, some for the purpose of injuring the credit and value of existing ones. But a remedy was found; it was by taking just such action as the railroad companies have been continually for years asking the right to take, and that has been denied them. They were allowed the freedom of considering practicable remedies, and, if thought best, acting on them—such as pooling business where thought wise; pooling earnings in cases where thought best; leasing in cases where thought best, and consolidating in other cases, as well as controlling by other methods. Now the whole telegraph business of the United States is practically done by two corporations—the Western Union and the Postal. Their charges as a whole are not now as unsatisfactory as the railroad transportation charges, because they are reasonable and are not continually changing or particularly favoring localities. Their methods are analogous to those of railroads. Railroads have an increased price for carrying passengers on fast trains or perishable property on special freight trains. Telegraph companies have an increased price for telegrams which are very important. Railroads, for cheap, coarse products have rates below the ordinary; telegraph companies, at similarly reduced rates, take messages that are to be transported in the night and delivered at their convenience in the morning. Railroads make reductions for a number of people going at one time. Telegraph companies make a reduction for long messages.

Now, the effect of this consolidation of telegraph lines, I think will be generally admitted, has been no injury anywhere, on the contrary it has been of benefit to their owners, to their employees and to the public. Why should not this be the result if railroads were allowed to move on the same lines? A few years ago new telegraph companies were constantly being organized to compete with an existing one. . . . The values of Western Union stock were constantly changing up and down, according to the movements of rival companies. One man prominent in these rivalries was the worst hated man in the United States. Yet that same man, after securing the control that he had been supposed for years to have been trying to secure, effected the consolidation of the various companies into what is now the Western Union. It was a distressed move on his part, and one that had there been organized power to defeat, would have been defeated. That man is now dead. Were the prophecies realized? I think we will all say No. Shall we not all agree that the results of that combination were favorable as a whole? . . . If this is the worked-out result of thought-transportation, why not try on these lines to work a result out for railroads transporting the people and their property? The success of the railroads is indissolubly bound up with financial, social, business and I think religious and moral success. They are never prosperous when the people are not prosperous. They cannot be prosperous unless the people are prosperous. The people cannot be prosperous in the broad sense of the word when railroads properly managed are not equally prosperous. There will be at all times incidental wrongs, but have we any right to suppose that there will be more in railroad management than in the case I have cited?

All our vast railroad construction has had to be paid for from some source, and from the day of its completion until to-day it has been and probably will, at least for the immediate future, continue to be operated. Is it not of vital importance to the whole people of this country that this investment may have a reasonable earning power through which the investors may be justly compensated?

Colonel Walker followed Mr. Porter. He said in part:

It is clear that there is a general disappointment in the operation of the interstate commerce law. The most ardent supporters claim for it a qualified success. The very people who framed it find it now reacting upon their standing before the community and are blamed for every existing grievance. The apostles of reform that clamored for the adoption of the act now justify themselves by accusing the railroads of conspiring to violate and break down the law. The railroads point to the law as a bogie man. And there are a great many complaints arising from the misunderstanding of what the law was meant to do. . . . The commission fell short in accomplishing its original purpose from the fact that it had no power to enforce its rulings. It was an administrative body without administrative powers, and a judicial body without court authority. The principles underlying the law were good principles, but they needed some governmental regulation in order to furnish substantial relief for the public and to protect the railroads from each other. The railroads are more helpless than any other industry, and their only weapon of retaliation is to reduce their own earnings in the hope of hurting their competitors. If something is not done it will not be long before their earnings will vanish.

Professor Hadley said that the law had been advocated and voted for in Congress by two different classes: One whose motives were to reform the abuses of railroads, which party was led by Senator Cullom, and the other led by Senator Regan, whose motive was to pull down the rates and bring down the profits of the railroads. There can be no question that during the first two years of its operation it was disastrous to the railroads, for their stock fell down to one-third of its value and their bonds suffered a corresponding decline. This was at a time when every industry was advancing, and in a period of prosperity instead of a period of depression. Since 1888 the growth of railroads has scarcely been proportioned to the growth of the country. It is doubtful if railroads would be worse off if the law had not been enacted. The falling off in railroad construction was felt in the lessening of the demand for iron and the disastrous effect of all this has been apparent throughout the whole business community. The clause against pooling is the worst feature of the Interstate Commerce act. Pools had been beneficial to the railroads themselves and to the business community. In the early history of the commission a mistake had been made in regarding its powers as of a judicial character. The law was a good one if the commission was given administrative powers to publish rates and if the prohibition against pooling was repealed or modified. The commission would accomplish a great deal more good when confined to its original administrative idea than to its subsequent quasi-judicial function.

Mr. Blanchard was the last speaker. He said in part: I think the law will result in clearer court definitions of reciprocal duties and rights, and will establish a more uniform transportation code, because it provides a non-political commission to deal between carriers and patrons. Its long and short haul clause has much equalized through and local freights, the disparities in which were urged as a chief reason for the law. Open rate wars have been less frequent, and trade, therefore, less disturbed. It has procured publicity of charges and more adequate public notices of changes in them.

Various classifications have been consolidated. It has procured an average reduction of rates. The advisory and warning powers of the Commission have lessened much public clamor and some undue railway procedure, because a majority of its decisions have been equitable and because the Commission's reports have proved educational. With diversities in conditions, costs and profits, proximation to water routes, sparseness of traffic in some localities compared with tonnage in others, etc., it is not reasonable to expect that the law would meet like views or support from all. . . . I ask commercial and legislative consideration for our interests because: The charges on nearly all the tonnage we carry average greatly less than for similar transportation elsewhere; our charges do not average one-half of those 15 years ago; these results have been achieved without national enactments; no inter-state tariffs have been reduced by judicial decree; the public should as justly pay for increased privileges by railways as in any other business. . . .

#### A Mammoth Hoisting Engine.

The greatest hoisting engine probably ever built is now being constructed in Milwaukee. It will operate a shaft on the property of the Tamarack (copper) Mining Co., in upper Michigan. This shaft is 3,400 ft. deep, and the engine will be large enough to hoist from a depth of 6,000 ft. The drum will consist of a double cone, with the greatest diameter at the center, and tapering toward each end, the smallest diameter being 13 ft. 9 in., the greatest diameter 36 ft., and distance across the face of both cones 24½ ft. The construction of these cones is very interesting. A cast-iron hub is keyed to the shaft from which a wrought iron "spider" will be built up, and over the latter will be laid a perfectly smooth boiler-iron cone made of matched plates. The grooves for the wire rope will then be put on over the cone by winding a rolled steel strip around the cone and securely fastened in such a manner as to form a perfectly even groove for the cable without the necessity of being turned off with a tool. The engine consists of a pair, with cylinders 32 x 84 in., with cranks at right angles. The shaft is 88 in. in diameter and about 38 ft. long, with suitable reversing mechanism. There will be separate cylinders to operate brakes and reversing gears, all operated from an elevated platform by one man.

The weight of the drum is 175 tons, and that of the whole engine 350 tons. The 7,500 ft. of 1½-in. steel cable on each half of the drum will weigh about 11½ tons. With the car at the bottom of the shaft, the weight of the cable which will do the hoisting will be greatly in excess of the weight of the load to be elevated. There will be two cars, one ascending as the other descends.



ESTABLISHED IN APRIL, 1856.  
Published Every Friday,  
At 73 Broadway, New York.

#### EDITORIAL ANNOUNCEMENTS

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMN. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

#### The Responsibilities of a Railroad Director.

The action to remove Receiver Oakes, because of his supposed complicity with alleged frauds upon the Northern Pacific while president of that company, raises some important questions apart from the merits of that particular case. Should public opinion establish a rigid rule that no officer or director of a railroad ought to make any money out of enterprises connected with the corporation he serves? It is a well known rule of law that a man cannot sell property to himself as an executor or trustee, without at least subjecting himself to suspicion. Is a railroad director in the same position? There is no doubt that a railroad president ought to be most careful not to put himself where his personal interest would be opposed to that of his company. For example, he ought never to sell his company's stock on a contract which will profit him only in case the stock declines in value, no matter how strenuously he may have labored to avert the expected decline; for the moment he speculates on the short side he creates a personal business interest different from that of his employer—a thing he has no moral right to do. "Unloading" doubtful properties on the company at extravagant prices would be a proceeding which it need scarcely be said is opposed to the ethics of an honorable man.

But if we make this matter of opposing interests a touchstone of the ethics of such matters, we ought also in fairness to consider the cases which such a standard might leave free from reproach. A corporation is formed for a definite purpose, under a charter which establishes both powers and limitations. In small matters such corporations are constantly going beyond their strict authority; for example, in subscribing to the World's Fair or to a half dozen summer resort ventures. But when permanent obligations are involved such risks are not taken, though the business necessity may be just as great. The usual course is to organize some outside company to do that which the railroad has itself no charter right to undertake. The usual argument in such cases is that such outside companies are entitled to an ordinary business profit, often being of much importance to the company indirectly benefited. In many instances the officers and directors have been unable to obtain outside capital unless supplemented by their own money as a guaranty of good faith.

The Western country furnishes some striking illustrations of this. The Northern and Union Pacific companies were chartered by Congress each to build a line of railroad between two specified points—nothing else. The acts of Congress do not even contain the (now) usual provisions allowing the roads to do such things as are necessary for the conduct of their business. Such commonplace powers have to be "read into" the charters, as the lawyers say. Even the legality of their guaranty of branch line bonds depends upon the implication and not upon set terms. When to this we add the fact that from the circumstances of the case the management of those same companies

must be more paternal in relation to new people and industries along the lines than is the custom on the older roads, we see that a really complicated problem is in sight, if we admit the proposition that lines in a new country must study to develop traffic.

If for any reason it is found advisable that a branch line be built from the main line of the Union or Northern Pacific, the question is, How shall it be done? The company itself is forbidden by its charter from undertaking it. No outside capitalist would venture alone, because he would be completely at the mercy of the big railroad company. The only way is to give such guaranties and allow such profits as will build the needed feeder. If the branch is really needed, it does not necessarily involve fraud if the directors put their money into the enterprise—very likely the branch would not be built otherwise. So with grain elevators along the lines and other enterprises of local character. The directors are familiar with the facts and possibilities and invest long before the Wall street man is willing to risk his money. Both officer and company may benefit; nor does profit imply wrong-doing. Such cases are very different from those first stated, where the directors' interest is opposed to that of the corporation.

Every good and fair thing is liable to abuse, and directors' investments along their own roads are no exception. The point we make is simply that the fact of such investments or their profitableness is not of itself enough to condemn the men or to justify the public in charging fraud. Each case must be judged on its merits. It might easily be that the establishment of enterprises by any one's money—particularly where the company itself is helpless—would be the source of much benefit to the railroad and help greatly to develop business and increase traffic. Such investments by officers of the road are not to be lightly condemned. One of the charges against Receiver Oakes is that he consented to pay \$2.50 a ton for coal from the Rocky Fork mines (Montana), also to the purchase of the railroad, at an advance over its cost, from the Rocky Fork Company. But these mines are the only ones between Duluth and the State of Washington, and at the price named they save the Northern Pacific, it is said, several dollars a ton over Ohio coal, transported by water to Duluth and thence by rail to Montana. Beside the doubt as to the legal right of the Northern Pacific to spend money for that purpose it would have cost that company a large sum if it had undertaken the prospecting for coal throughout that vast region. The fact of the purchase of the Rocky Fork railroad and coal (500,000 tons a year) is of itself no evidence of anything but good judgment. It is not evil because the original owners—one or two of them directors—made a handsome profit.

Yet because of the temptations inherent in such transactions it is better that they should be avoided, and that the director should have no interest in anything sold to the company of which he is a trustee. As we have said, every case should be judged on its merits. But a railroad director is in such a position that he often cannot afford to have his conduct judged on its merits, for his judges, on account of their position or prejudices, are incapable of fairly estimating the merits of his action. He may make only \$10 for himself while making \$100 for the road, but if a thousand individual stockholders judge him unfairly for taking \$10 instead of \$5 he has practically no argument by which to justify himself. They will insist that their standard is right and his wrong, and he must acquiesce. He cannot get an unbiased decision that will satisfy his opponents, and his only peace, therefore, is in avoiding the issue, if he wishes to retain their confidence. And as for the sentiment of the general public, he can, of course, expect favorable judgment only when he keeps well clear—on the right side—of the dividing line between self-interest and fidelity to his trusteeship. No director can afford to keep close to that line, for people cannot (or will not) see it with distinctness and there can therefore be no assurance that they will judge fairly.

#### Smokebox Vacuum, Temperature and Cinders.

Mr. W. B. Hampson, now of the University of Nebraska, asks for an explanation of the causes of the increase in the smokebox temperature and in the cinders collected in the smokebox during the shop tests of a locomotive which have been reported by Prof. W. F. M. Goss in the *Proceedings of the American Society of Mechanical Engineers* for 1893. He writes:

I have read with much interest the reports of the Purdue locomotive as printed in the *Railroad Gazette*. I have a copy of Professor Goss' report before me and find that test number 20 shows 633 lbs. of sparks in the smokebox from a consumption of 4,540 lbs. of coal, while, on the other hand, test number 19 shows 289 lbs. of sparks with a consumption of 4,824 lbs. of coal. Why did so many more sparks go through the tubes with

only 0.4 in. more draft? The smokebox temperature was also much higher in test 19 than test 20. I feel a special interest in these tests, as the majority of them were fired by myself. I also assisted in the calculations of several of them.

In a letter to us Professor Goss writes: "I do not think it is possible to give a satisfactory answer. The data are insufficient for the establishment of the theory. As you have said, the draft condition is not the only one affecting the matter of cinders. I might call attention to the fact, however, that the volume of cinders increases very rapidly with an increase of draft."

In a recent issue we published a report of some tests made with compound and single expansion locomotives on the Long Island Railroad and in this issue we print an extract from a paper by Mr. Barnes before the Engineering Congress at the World's Fair which calls attention to the increased waste of fuel which follows an increase in the rate of combustion per square foot of grate per hour, all of which bears on the subject in question. It has been clearly proved that the vacuum in a smokebox is very largely dependent upon the resistance which the air meets in coming through the grates. This arises from the fact that the vacuum-producing element, which is the exhaust steam jet, has a limited capacity for exhausting gases from the smokebox, and if the gases are admitted in large quantities the vacuum will be lessened because of the insufficiency of the steam jet. The opening of the fire door, a small section of bare grate, or a thin, open fire, will materially reduce the vacuum. In the Baltimore & Ohio tests, reported in the *Railroad Gazette* of Nov. 27, 1891, the vacuum reached the large amount of 16 in. of water, mainly because the fire was very thick, in some cases averaging nearly 20 in. This thickness was necessary in order to enable the locomotive to pull its load up a heavy grade without tearing up the fire. A slight difference in firing which gives a difference in the thickness and openness of the fire will produce a material difference in the vacuum. If a fireman maintains a thin fire at the front end of the firebox the increase in the cinders collected in the smokebox will be very great as the action of the draft is localized at one part of the firebox, and therefore more fuel is lifted and conveyed to the smokebox.

This shows that the amount of cinders collected is dependent upon three things, viz., the amount of vacuum, the method of firing and the thickness of the fire. Even with considerably less vacuum more cinders may be produced in one case than another if the fire is thinner and the method of firing is such as to localize the action of the draft in one section of the firebox.

The facts thus far collected indicate that the vacuum, with the same exhaust apparatus, is dependent upon three conditions: the method of firing, the thickness of the fire and the area of openings through the grate. As the exact conditions of firing, the thickness of fire and area of grate opening were not determined in the tests in question, it is impossible to give our correspondent a specific answer; but it is clear from what has been said here that the increase in the sparks collected in the smokebox is not so great as to fall without the limitation here mentioned.

The smokebox temperature is dependent upon several conditions: the smokebox vacuum, the thickness of the fire, the method of firing and the actual rate and intensity of combustion; and as the intensity of the fire may vary considerably with these conditions, and as the facts relative to these conditions were not collected, it is evident that no explanation can be given as to the increase in smokebox temperature. But as the increase was only about five per cent., it easily falls within the limits here outlined, and does not in any way indicate abnormal or unusual conditions during the test.

This subject is one that the Master Mechanics' Association committee on exhaust nozzles has in hand this year, and some definite conclusion may be reached that will aid in answering such inquiries as those of our correspondent.

#### The Present Status of the Car Coupler Question.

The General Superintendent of one of the larger roads sends us a letter\* on the above-named subject which is so typical that the following somewhat elementary reply is published as of possible interest to other readers.

1. The Master Car Builders' vertical plane coupler is probably the only type that will be used finally, as it has been shown to be adequate for all demands.

2. Of all the different designs of M. C. B. couplers that

\* We are considering the advisability of making a change in drawbars used on this system. With that intent in view we are looking over the merits of the various types of vertical plane couplers. As you have published several interesting articles in *Railroad Gazette* on this subject, giving reports made by various committees of the M. C. B. Association, I shall esteem it a favor if you will kindly give me reference to these articles.

have been offered, the best is the simple type having four pieces, as follows: One knuckle, one knuckle pin, one locking pin and one coupler head. These parts are enough to make a perfectly practical coupler, and it has not been shown by practical service that any more parts are necessary.

3. No type of self opening knuckle has been proved to be a practical or desirable design. All the safety, uniformity, interchangeability and other desirable characteristics that can reasonably be asked for are found in a coupler that will couple automatically where the knuckle has been opened by hand, and that can be unlocked from the side of the car. Train men have to go between the cars to couple and uncouple the air-brake hose so that automatic knuckle opening does not eliminate this danger.

4. Since the original Janney has been brought out, some improvements have been made in the location of the material to strengthen the coupler; notably the moving back of the pivot pin so that part of the knuckle may pass in front of the lugs, and also a substantial increase in the bearing area of the knuckle and shank against the lock, which increases the durability of the coupler.

5. All couplers now should have the top buffer stop which should strike against an iron plate on the end sill before the drawbar springs reach by  $\frac{1}{4}$  in. their ultimate compression.

6. The guard arm, which is the weakest part of the coupler, should be made as strong as possible; and this has been done by putting more ribs on the back.

7. The actual results from service and the tests made at Altoona and in Chicago show very clearly that the cast steel coupler is stronger than the best malleable iron coupler, and they also show that ordinary or bad cast steel couplers are not so good as the best malleable iron couplers. They further show that ordinary malleable iron is not strong enough for couplers.

8. Couplers weigh about 440 lbs. per car. The original price was \$25, which is equivalent to about 5.7 cents a pound. The best cast steel couplers can now be purchased from your own patterns for four cents a pound, which is a cost of \$17.50 a car. The best malleable iron couplers can be purchased from your own patterns at three cents a pound, which gives a cost of about \$13.20 a car. The best malleable iron is probably strong enough for car couplers, but there is as wide a difference between the different kinds of malleable iron as between the different kinds of cast steel, and both require very close inspection.

9. All of the essential patents on the M. C. B. coupler have expired and you can make your own design and your own patterns. If you purchase from manufacturers of couplers, you will have to pay more than the above price, but you can get a guarantee, which will act as a rebate and make the final cost nearly the same as if you purchased couplers from your own patterns; and beside there will be some saving in the close supervision of the manufacture, which you will have to undertake if you should purchase from your own patterns. This is the only value of a guarantee from a car coupler manufacturing company, for the reason that no guarantee yet offered contemplates paying for the actual cost resulting from broken couplers. The direct loss from breaking of the car coupler in service amounts only to the cost of labor and material to replace the parts broken. The indirect losses are much greater, viz., the delays on the road, the wrecks of cars resulting from the parting of trains, etc. Hence in no case should couplers be purchased either from your own patterns or from manufacturers without the most rigid inspection in order to protect the railroad against the indirect losses.

10. The wear of couplers in service is very small when the knuckles are made of cast steel, and you will find that the cost of maintenance is only about one-quarter of the cost of maintaining the link and pin drawbars, provided always that you take the simple type of vertical plane coupler and the best material. The material put into car couplers is more severely strained than any other material used in railroad equipment, except axles and wheels, and therefore should be of a superior quality.

The following references to the *Railroad Gazette* for 1893 give the different recent statements of what has been done to determine the comparative values of different designs and material and what has been done in the past to improve the designs:

Page 113.....	Feb. 10	Page 539.....	July 21
Page 284.....	April 14	Page 545.....	July 21
Page 323.....	April 28	Page 548.....	July 21
Page 414.....	June 9	Page 569.....	July 28
Page 418.....	June 9	Page 617.....	Sept. 1
Page 450.....	June 23	Page 655.....	Sept. 1
Page 460.....	June 23	Page 681.....	Sept. 15
Page 475.....	June 30		

During the interval between the tests in Chicago and the tests at Altoona, changes were made in designs and material, which enabled makers to meet the tests at Altoona after they failed in Chicago.

Experience thus far shows that the Master Car Builders' proposed tests are not too severe. Hence, in purchasing couplers it is well to examine, by actual test at Altoona or some one of the several other places where apparatus is provided for public use, the nature of the material and design before purchasing.

#### The Railroad Bond Market for February.

The market for railroad bonds has been much more active than the stock market during the past month.

On active days over 100 different issues were dealt in. The principal demand was for high class investment bonds, which was satisfied with but little changes in price.

Of the eight groups, comprising the principal issues of the country, all but one show an average advance. The data from the market reports are tabulated as follows:

Receivership group, advance.....	\$1.37
Grangers, advance.....	1.10
Trunk Lines, advance.....	.58
Southwestern, decline.....	.12
Transcontinental, advance.....	.62
Coasters, advance.....	.62
Southern, advance.....	2.12
Miscellaneous, advance.....	1.08

The conditions which caused this advance are fundamental. As stated a month ago the worst in the railroad situation was known some time since, and any change which takes place is naturally a change for the better. This is typically shown in the receivership group, which advanced \$1.37 in the month. Money has continued to accumulate in commercial centers, and about the only outlet which it has had is the bond market. During the month of January, it will be remembered, there was a slight setback in prices of bonds owing to a falling off in the demand. This was caused primarily by the waiting attitude of the savings banks, which in turn was an outgrowth of the unsettled condition of affairs in the labor world, and a desire on the part of those institutions to allow depositors to express their intentions regarding a continuation of deposits upon the payment of January interest. The demand from capitalists was influenced by increasing complications in business affairs, largely caused by the indefinite legislative situation. A month has shown that the depositors for the most part are allowing their money to remain in the banks while the approaching end of tariff legislation seems to foreshadow a business revival, which has had a slightly stimulating effect upon capital. The course of the bond market has been entirely different in its phases from the stock market. The latter has been exceedingly quiet, limited, narrow and almost entirely professional. Operations were based upon Washington rumors and the development of the tariff situation. The continued decline in wheat had a depressing effect.

In the Receivership group noteworthy advances took place in the St. Louis & San Francisco, Erie, Reading, Union Pacific, Oregon Short Line and Wisconsin Central. This was upon the change in the status in affairs regarding those properties and the approaching reorganizations. The Erie plan seems to be less opposed by foreign shareholders. This has imparted some strength to the company's various securities. The Northern Pacific issues continue weak with the exception of the Terminal fives, which advanced five points. The most noteworthy advances were in Wisconsin Central firsts of 11 points and in the Incomes, 4 points. The latter was a movement in sympathy with the former.

The Grangers were all strong on a good investment demand, much of which came from small investors. The same can be said of the Trunk line issues. The Southwestern group suffered an average decline under free offerings based upon adverse business conditions in that section. The Southern group, with an average advance of \$2.12, led the list. This group embraces the Louisville & Nashville issues. The passage of the dividend by this company reflected a conservative policy which is favorable to the bonds.

Complaints having been made that the Prussian State Railroads do not provide a sufficient stock of cars to accommodate the freight traffic, the management has published tables showing the number and capacity of the several kinds of cars every year since 1880. It appears from this that at the close of the fiscal year 1891-92 the State Railroads had 26.8 axles per mile of road, against 25.7 in 1880-81 and 25.1 in 1887-88. But the average capacity of the cars has increased meanwhile, and the tons of freight car capacity per mile of road have been:

	1880-81.	1887-88.	1891-92.
Covered cars.....	41.3	55.1	38.3
Open cars.....	11.3	93.0	111.1
Stock cars.....	11.5	8.5	6.6
Total.....	110.1	156.6	156.0

Important additions to the system were acquired in the earlier years, so that it is not proved by the figures that the car supply was less equal to the demand in 1887-88 than in 1880-81. Since 1888, about 15 per cent. has been added to the car capacity per mile. It must be remembered that Prussia does not grow like America. It will be seen that there are about three open cars to one box car. The increase in the average capacity of cars has been made almost wholly in the last two years, and is still small. Open cars carried 10,872 lbs. per axle in 1881, only 110 lbs. more in 1888, and 11,356 lbs. in 1892. The transformation of 10-ton into 12½-ton cars has been made chiefly since that year, apparently. Nearly all the freight cars have but two axles. The 205,476 cars in 1892 had 418,514 axles. The covered cars have a little less capacity than the open ones, averaging 11,262 lbs. per axle in 1892, against 10,449 in 1888. Further, the cars were better utilized than formerly; the average mileage of freight cars was 8,614 miles in 1880, rose to 9,896 miles in 1883, and to 10,952 in 1889, which is the maximum so far, the average in 1891-2 having been 10,347, and the smallest for four years. Further, a smaller (but only a little smaller) proportion of the mileage is of cars running empty. The propor-

tion of car capacity loaded remains substantially the same, and was 47 per cent. of it in the last year. The freight traffic per mile has increased nearly every year since 1885, and in 1891-92 was 749,280 ton-miles, equal to 1,614 tons each way daily—only one-third more than the average on our great system, while Group II., of the Interstate Commission, including the lines west of New England, east of Ohio and north of the Potomac, had a freight traffic averaging 2,044 tons each way daily; and Group III., west of Group II. to Illinois, one of 1,166 tons. The average haul in Prussia has varied since 1885 only from 197 to 185 miles. The freight earnings per mile would in this country be thought very steady. Since 1886 they have varied from \$8,716 to \$9,647, the latter in 1889-90. In 1891-92 they were \$9,465. The average rate per ton per mile has decreased steadily, but very slowly, from 1.465 cents in 1880-81, to 1.34 in 1885, and 1.27 cents in 1891-92, when the average in this country was 0.898 cent. The Prussian average is thus 40 per cent. more than ours.

The *Commercial and Financial Chronicle* has collected and published statements of the gross and net earnings of 198 railroads for the year 1893, having an aggregate of 117,138 miles of road, which is about two-thirds of the mileage worked during the year. As usual, when earnings are growing worse instead of better, some companies cease reporting, except for their fiscal year; and comparatively few companies now make their calendar year the fiscal year, accommodating themselves to the year ending with June for which they must report to the United States and the various State authorities. Thus the *Chronicle* was able to get reports from 210 companies for 1892 and from 219 for 1891, against 198 this year.

The last year was made up of a first half (or five months at least) of pretty good business, and a last half of very bad, the latter modified for many railroads by unusually heavy passenger earnings caused by World's Fair travel in the face of an extraordinary stagnation of general business. The result for the whole year is a trifling change—a decrease of 1.68 per cent. in gross earnings, and of 0.9 per cent. in net. Per mile of road there was a decrease from \$8,546 to \$8,200 in gross earnings, and from \$2,678 to \$2,513 in net earnings—3.35 and 5 per cent. respectively. That the railroads reporting have much heavier earnings than the average railroads of the country may be known by the fact that the average gross earnings per mile of all our railroads in the year to June 30, 1892, were but \$7,213, indicating an average of only about \$4,000 per mile for the roads not reported in the *Chronicle*.

The change for the year would be quite insignificant were it not that earnings usually increase from year to year, and are expected to increase. It is true that usually there is a larger increase in mileage than last year; and we shall see the normal course of things better by comparing the average earnings per mile, which have been four successive years, according to the *Chronicle's* reports:

Gross and Net Earnings per Mile of Road Reported in Successive Years.

Year.	Miles.	Year.	Miles.
Gross.....	1893 from 117,138	Gross.....	1892 from 115,152
Net.....	2,513 in 1893 from 117,138	Net.....	2,678 in 1892 from 115,152
Gross.....	2,233 in 1892 from 131,625	Gross.....	7,892 in 1891 from 130,166
Net.....	2,627 in 1892 from 131,625	Net.....	2,598 in 1891 from 130,166
Gross.....	8,138 in 1891 from 135,612	Gross.....	7,955 in 1890 from 132,811
Net.....	2,606 in 1891 from 135,612	Net.....	2,490 in 1890 from 132,811

Thus the roads reporting gained \$183 in 1891 and \$341 in 1892 in gross earnings per mile, against a decrease of \$286 in 1893; and in net earnings per mile gained \$116 in 1891 and \$29 in 1892, against a loss of \$135 in 1893. A gradual increase in earnings per mile is not only expected, but in many cases is counted upon to meet increasing interest, rents, etc., so that even a trifling decrease causes many companies embarrassment.

But the course of earnings for the year does not represent the present or recent course of earnings. For the first half of the year the *Chronicle* reported an increase of 3.53 per cent. in gross and of 1 per cent. in net earnings on 181 railroads then reporting, having  $\frac{1}{4}$  per cent. more road than the year before. The change from the first to the second half of the year, in some cases, is very great. For instance, the class called the Pacific railroads earned nearly the same both years during the first half of the year (\$185,400, or  $\frac{1}{3}$  of 1 per cent., less in 1893), while in the last half their gross earnings decreased \$9,154,130 (13½ per cent.), and their net earnings, \$4,799,405 (18 per cent.). The Atchison gained \$1,501,000 gross in the first half and lost \$2,305,000 in the last half; and in net gained \$474,448 (9½ per cent.) in the first half and lost \$616,566 (8½ per cent.) in the last half. The trunk lines in gross gained two per cent. in the first half and lost 6.6 per cent. in the last half, etc.

The hearing at Milwaukee, on the petition of Mr. Arthur and other labor leaders, to secure a modification of Judge Jenkins' order prohibiting a strike, has been postponed until March 2. The employees of the Union Pacific, in Oregon, have applied, through their counsel, to the United States Court at Portland, for a modification of the order approving the action of the Receivers of the road in reducing wages. In St. Louis on Feb. 26, Judge Caldwell, of the Circuit Court, issued an order calling for a meeting in Omaha on March 15 between the representatives of the employees of the Union Pacific and the Receivers. Judge Caldwell will listen to both sides on March 27 in Omaha. This would seem to vacate

Judge Dundy's order approving the reduction of pay on March 1. President Clark is designated to represent the Union Pacific. George L. Hodges, counsel for the Union Pacific employees, appeared before Judge Riner in the United States Circuit Court at Cheyenne, Wyo., Feb. 27 and obtained an order that the schedule of pay and rules which were in force when the Receivers took charge be continued in effect until further orders of the Court. The Court further directs that Receivers cause notices to be distributed among the employees. It is said that the Receivers were notifying the employees that the new schedule providing for reduced wages would be enforced regardless of the fact that Judges Hallett and Riner had refused to enter Judge Dundy's order in their jurisdictions.

The report on immigration of the Bureau of Statistics affords a sound basis for estimating the total gain in population for the year. Taking the population of 1880 and adding to it 1½ per cent., plus the immigration for the fiscal year (to June 30) and continuing the process yearly, we find 62,860,807 as the population in 1890, when the census enumerated 62,622,250—a result as close as could be expected from any basis of estimation. Continuing this process since the last census, we have:

Population by Census, 1890.....	62,622,250
Natural increase to June 30, 1891.....	834,963
Immigration to June 30, 1891.....	560,319

Population June 30, 1891.....	64,017,532
Natural increase to June 30, 1892.....	853,567
Immigration to June 30, 1892.....	623,064

Population June 30, 1892.....	65,494,163
Natural increase to June 30, 1893.....	873,256
Immigration to June 30, 1893.....	502,917

Population June 30, 1893.....	66,870,336
-------------------------------	------------

By the close of 1893, at this rate, the population was just about 67,500,000, which is at the rate of 385 per mile of railroad. Last year was almost the only one since the war when the increase in population was larger in proportion than the increase in railroad mileage—2.1 per cent. against 1.5 per cent.

The annual convention of the Railroad Young Men's Christian Associations of the country is to be held in New York, March 29, and the announcement of the committee is printed in another column. Every railroad officer who is acquainted with the work of these associations heartily commends them, and it is a pleasure to bring the convention to the attention of all who are not familiar with the associations. The annual report of the Railroad Department shows that there are now in the United States 95 railroad associations, 116 railroad secretaries and assistants and 23,000 paying members. Thirty-six associations occupy buildings owned by them or assigned to their exclusive use by railroad companies. In those associations from which statistics have been gathered it is found that about one-fourth of the current expenses were contributed by employees and the balance by the railroad company.

#### NEW PUBLICATIONS.

*Machinery for Metalliferous Mines.* By E. Henry Davies, E. M. F. G. S. New York: D. Van Nostrand Company. 1894. Pp. 564; Pl. IV.; cuts 314.

Mr. Davies' conception of his subject is so broad that fully 250 pages of his book relate to matters which concern the civil engineer as vitally as his brother of the mines. Indeed we are impressed with the fact that not only is his conception of the subject broad, but that his treatment of it is broader, and herein lies the chief defect of the work. It is not a handbook, neither is it an exhaustive discussion. Mr. Davies calls it "a practical treatise," and going back to root meanings a treatise is a "meddling with," and truly he has meddled with some important matters, as when he attempts to cover the question of "steam boilers, steam engines and oil engines" in a single chapter of 23 pages. This is an extreme case, but it leads directly to an estimate of the value of the book, for it has a distinct value, an unquestionable *raison d'être*. He has called it a *practical treatise*, and that is just what it is. Mr. Davies is very much of an empiric. His knowledge is of that tough sort which a man acquires in the rough and tumble experience. When he knows, for example, that a Pelton water wheel in actual service will develop as high as 88 per cent. of the theoretical horse power of the fall he wastes no time in discussing the mathematics of the question, nor in bolstering up the reputation of the turbine. He simply tells the facts, gives a few cuts by way of explanation, and adds a table of powers corresponding to diameter of wheel and head in feet, which, by the way, would have been more valuable had the prices been omitted and the volumes of water needed been substituted. But, as we said, this is not a handbook. It gives brief accounts of the most important machines in successful operation, embracing water-wheels, windmills, ventilating machinery, hoisting machinery, drainage devices and pumping machinery, rock drills, air compressors and boring machinery, their comparative efficiency and cost. This feature will be particularly appreciated by many young engineers, as it will serve to show what special appliances are in the market, and, approximately, what may be expected of them. Had Mr. Davies gone farther in this direction he would have accomplished a still more useful purpose, for, unfortunately, as a guide to special machines, it is not as full as it might easily have been, but this defect is only another result of empiricism.

The chapters on electricity as applied to engineering operations are well presented, and should encourage many of the more conservative engineers to adopt this power where conditions are favorable. The easily portable combination of the Pelton wheel and the dynamo is peculiarly adapted to temporary installations, and will frequently lead to important economy in the driving of tunnels and in other work connected with railroad construction.

The chapters relating exclusively to mining machinery are perhaps the most ample in details, and it is noticeable that the author, who is an Englishman, has drawn widely from American experience, and accords to our devices that pre-eminence of merit which is recognized by experienced and unbiased men throughout the world.

The illustrations, while not of high order, are clear, and constitute a valuable part of the work.

*Compendium of Transportation Theories.* Kensington Publishing Co., Washington, D. C.

This book, which is the first of the "Kensington Series," heretofore announced, is published under the editorship of Mr. C. C. McCain, Auditor of the Interstate Commerce Commission. It consists entirely of essays upon railroad subjects which have appeared during the past two or three years in various papers and magazines and which are pretty well known. They are reprinted without alteration or comment and even without an index, although there is a list of contents which does not give the pages. There are 34 essays in this book, including papers read before the national conventions of state railroad commissioners and articles in the *Independent*, the *North American Review* and other papers. Among the authors are Judge Cooley, Ex-Commissioners Schoonmaker and Walker, Commissioner Knapp, Prof. Henry C. Adams, W. M. Acworth and Gen. E. P. Alexander. General Alexander is now entirely out of railroad service, and the proofreader, reluctant to let him appear without any business title at all, calls him "Associate Editor of the Railroad Gazette."

*The Practical Engineer's Pocket Book and Diary.* By W. H. Fowler. Technical Publishing Company, Manchester, England. 225 pages. Pocket edition. Price, 1s. 6d.

This is a useful little book for mechanical and electrical engineers; and in addition to valuable information, tables and data, it contains a diary of 62 pages in which to write the events of every day in the year. The front pages of the text are devoted to tables of standard weights and measures, rules and table for mensuration and computation. The design and construction of boilers is treated and mathematical formulas given by which to determine the size and strength of each part, including the chimneys and flues. Specifications and detailed drawings are given for a Lancashire boiler. The steam engine is also treated in a comprehensive and careful manner, and many formulas and rules applicable to it are given. The subjects of friction, hydraulic engineering, heat and its effects, the strength of materials, gas and oil engines are also treated, and the information on these topics most frequently sought is given in such ready shape as to be quickly applied to practical problems.

#### Russian Railroad Notes.

The Russian railroads (exclusive of those of Finland and the Trans-Caspian Railroad) had 18,542 miles of line in 1892, which was 302 miles more than in 1891. Their gross earnings decreased from 148 to 147 million dollars; their working expenses increased from 89 to 94½ millions, and their net earnings fell from 59 to 52½ millions. Per mile of road gross earnings were \$8.035, and net earnings \$2.880. The expenses were at the rate of \$1.06 per train mile.

The lines worked by the Government were much poorer than the average, their gross earnings having been \$6.003 and their net \$2.011 per mile, against \$9.185 gross and \$3.377 net on the private railroads. The train movement in Russia was 132,911,000 miles, which is equivalent to 9.8 trains each way daily, against 6.8 in this country. The average expenditure in Russia for railroad service was about \$1.63 per inhabitant; here, \$18.00.

There is an important fish traffic over the railroads leading from the Volga and the Caspian Sea to Russian towns, and provision has recently been made to carry live fish to the chief markets by means of tank cars in which water in winter is kept at a suitable temperature by heating apparatus. How far people here would be willing to pay for carrying several pounds of water with every pound of fish is a question; but there is no question that the quality of the fish is incomparably better if they are kept alive until they are cooked.

International courtesy and the extent to which the coarsest articles of consumption are now obtainable from remote quarters of the world are both illustrated by recent action of the Russian Ministry of Transportation. There was last summer a short crop of forage in western Europe, and in consequence a supply has been sought in the extreme southeast of European Russia, north of the Caucasus range, at a distance of about 1,700 miles in an air line from the German border, where there was plenty of hay and straw to spare. But as a contagious cattle disease prevailed in the Caucasus

country, western governments expressed the fear that it might be imported with the forage; whereupon the Ministry issued an order forbidding the railroads to accept forage in that district for transportation to western Europe.

We do not remember that the Texas authorities ever forbade taking cattle north from that state, though we do remember that the states farther north protested that these cattle gave their home herds the Texas fever. We fear that if the Governor of Texas himself had published such a prohibition, the cowboys wouldn't have minded.

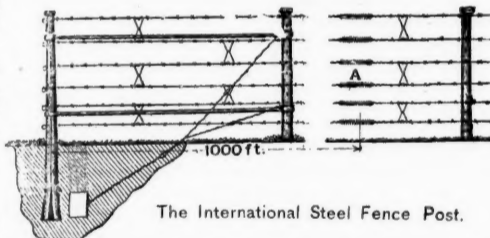
A French company is seeking a charter for a railroad over the mighty Caucasus range, which would connect Trans-Caucasia—the former Circassia and Georgia—with the European railroad system. The scenery in the Caucasus is magnificent, but Trans-Caucasia (bordering on Turkey and Persia, with Mt. Ararat on its southern border) is already easily accessible by the Black Sea and the railroad which connects it with the Caspian. This, it is true, does not bring you among the mountains; but the number of tourists who will travel 2,000 miles and more to see mountain scenery where roads, hotels and civilized human beings are as rare as they are now in the Caucasus will not go far toward supporting a railroad.

There is talk of building a branch of the Trans-Caspian Railroad southwestward through the mountains to the great fortress of Kars, in Armenia, close to the Turkish border, a distance of about 120 miles in an air line. With such a railroad Russia would be able to attack Turkey in the rear with great effect, probably.

The railroad from Moscow to Nishni-Novgorod, which the government has recently acquired, is to be leased to a corporation. Among the requirements which the government is said to insist upon is that the lessee shall build a permanent bridge at Nishni for the use of the great fair held there yearly, and harbor accommodations for no less than 1,000 river craft.

#### A New Steel Fence Post.

Notwithstanding the great efforts that have been made and are being made to prevent spark throwing by locomotives it is generally desirable that fences along the right of way be fireproof. It is quite necessary also that where prairie fires are of yearly occurrence, as in parts of the West, the fences be fireproof. The wire fence is in quite general use, but it is usually supported by wood posts, and when these are burned off the fence is destroyed. Solid metal posts have been used, but the hollow sheet steel post shown in the cut is the first of this description to which our attention has been called. The post shown is made by punching the right shape out of a steel plate and then rolling. Where there are



The International Steel Fence Post.

not too many stones and no hardpan, these posts may be driven, and the shape of the lower end is such that in driving the end flares, as shown, and gives the post a very firm hold in the earth.

The method of staying the corner posts, shown in the illustration, has proved satisfactory. Two other improvements in wire-fence construction are shown; one is the telescopic guard, the design of Barkley & House, fence contractors, of Chicago, which was described in the *Railroad Gazette* of Dec. 23, 1893; and the springs shown at A. These springs are spaced about 1,000 ft. apart where the fence is a long one, otherwise at the end of the fence opposite to that at which are the stretchers. The springs are used to keep the wires taut at all temperatures to which they are exposed.

The steel post shown is manufactured by the International Steel Post Co., of Chicago. It was awarded three medals at the World's Columbian Exposition.

#### TECHNICAL.

##### Manufacturing and Business.

The office of Mr. W. H. Breithaupt, Civil Engineer, has been removed from 18 Broadway to 73 Broadway, New York.

The Westinghouse Electric & Manufacturing Co. has established an office in the Mills Building, San Francisco, in charge of Mr. H. A. Russell as representative and Mr. R. B. Elder.

A petition has been filed in the Superior Court at Cincinnati by William Lodge and other minority stockholders of the Lodge & Davis Machine Tool Co., to dissolve the corporation.

Arthur Crandall, formerly with the Q & C Company, has established an office in the Western Union Building in Chicago, and will manufacture and deal in railroad supplies and equipments.

The Detroit Lubricator Company reports a better

business last month than during the previous month. The improvement, however, is not very decided, but the trade outlook is brighter.

Riehle Bros. Testing Machine Co., Philadelphia, has arranged with the patentees for the exclusive manufacture of the Riehle-Anderson track jack. This jack has been indorsed by practical railroad men, and will, no doubt, meet with a large sale.

The Connable Veneer & Lumber Co. has been organized at Memphis, Tenn., to manufacture hardwood, veneer and lumber for the car building trade. L. Connable is President, J. H. Bootes, Vice-President; and J. L. and R. M. Connable, General Managers.

The Industrial Works of Bay City, Mich., have recently sold two of their locomotive cranes to the Middlesex Quarry Co., Portland, Conn., and one 10-ton crane to the New England & Western Granite Co., Mason, N. H. These cranes are to be used for shifting and loading cars.

A plan for the reorganization of Cofrode & Saylor, Incorporated, and the Reading Rolling Mill Co., has been submitted to the creditors for acceptance with the favorable recommendation of the Committee of Creditors. This statement gives the total liabilities of Cofrode & Saylor as \$676,714, and of the Reading Rolling Mill Co. \$526,255.

The Minneapolis Rolling & Forge Co., which has been organized as the successor of the Minneapolis Rolling Mill Co., will, it is stated, operate the plant in North Minneapolis immediately. The incorporators are E. S. Baring-Gould, A. Z. Levering, W. A. Koon, J. S. Smith, S. C. Tooker, F. E. Zonne and A. Y. Davidson, all of Minneapolis.

The Whiting Foundry & Equipment Co., and the Whiting Car Wheel Co., were organized last week, the former with a capital stock of \$100,000 and the latter with a capital of \$75,000. The incorporators of both companies are the same—Nathan G. Moore, William B. McIlvaine and Max Baird. Shops are being built by these companies at Harvey, Ill.

One of the Jones under-feed mechanical stokers, such as was described in the *Railroad Gazette* of Jan. 28, has been in use for some time on one of the tugboats of the Dunham Towing & Wrecking Co., of Chicago, and has given complete satisfaction. Swift & Co., of Chicago, are also putting in these stokers in their plant at the Union Stock Yards. Five are in use and 10 more have been ordered.

The Pintsch gas light is to be used in the cars of the Long Island Railroad, and the Safety Car Heating & Lighting Co. is now building a gas plant at Long Island City for equipping all the new cars of the road with the light. The Cleveland, Cincinnati, Chicago & St. Louis has also decided to use the Pintsch system on all passenger and mail cars. Additional gas plants will be erected at Indianapolis and at Cleveland, plants being already built at Chicago, St. Louis and Cincinnati.

Mr. H. F. J. Porter, who was Assistant Chief of the Machinery Department of the World's Fair, has formed a partnership with Mr. Albert Fisher, formerly the Chicago representative of the "Ball," "Watertown" and "Green" engine companies, under the name of Fisher & Porter, to carry on a contracting engineering business in the line of complete equipment of steam plants, giving especial attention to large work. They are the Western representatives of the Providence Steam Engine Co. and the Altoona Manufacturing Co.

The Standard Supply & Equipment Co. has been organized to deal in railroad equipment and specialties. The President is W. Barklie Henry, formerly of the firm of Ralston & Henry, of Philadelphia. The new company will make a feature of construction tools and railroad and contractors' materials, having arranged to represent several prominent manufacturers of this class of goods. Second-hand rails, cars and other supplies will also be dealt in. The office of the company is at 22 South Fifteenth street, Philadelphia, near the Broad Street Station.

#### New Stations and Shops.

The Union Pacific officers have determined to spend a considerable sum on improvements on its machine shops at Laramie, Wyo., and it is understood that plans have been made for building a new roundhouse at Laramie to cost about \$65,000.

The date for starting up the new shops of the Great Northern at Hilyard, near Spokane, Wash., is now set for April 1, though very little work is now going on. Some machinery has been delivered and is being set up in the various buildings. The shops will probably not be running in all departments before the end of May.

The officers of the New York Central & Hudson River Railroad have informed the people of Syracuse, N. Y., that the erection of a new station in that city will be commenced early in the spring. The plans provide for a three story structure of Onondaga limestone to be built on the site now occupied by the Leland Hotel. Several of the streets in the city will be depressed by the company in making the improvements.

#### Iron and Steel.

Work on the plant of the Los Angeles Iron and Steel Co., at Los Angeles, Cal., is nearing completion.

The Milwaukee Malleable Iron Co. has decided to re-

move its shops to Waukesha, Wis., and will erect larger buildings than those recently burned at South Milwaukee.

The Midvale Steel Works has sublet a large contract for finished steel to be used in the construction of canal locks to the Harlan & Hollingsworth Co., of Wilmington, Del. It will take three months to complete the contract. Some pieces of the finished steel will weigh 3,000 lbs. All of the old employees of the company who have been idle for several months will be given employment. About \$10,000 is involved in the contract.

#### Soundings for a Railroad.

J. E. Robinson, artesian well borer, of 1301 Market street, Philadelphia, has completed soundings for the proposed Reading Railroad subway along Pennsylvania avenue from Thirteenth to Thirtieth street, Philadelphia. Samples of the different strata found have been preserved in glass tubes and make an interesting geological study. Records of the depth of each boring, as well as the thickness of each stratum penetrated, have been kept, bedrock being reached at varying depths along the line.

#### Test of the Webster Steam and Oil Separators.

The following is the result of the test on the Webster steam and oil separators made at the World's Fair by Mr. George H. Barnes. The two separators were of the same size and construction. They were attached to a duplex steam pump supplying water to one of the boilers. In the test of the steam separator a drip chamber was introduced in front of it. The following gives the results of the test:

Steam separator test:	
1. Weight of water drawn from the separator per hour when drain pipe of drip chamber was closed.	26.1 lbs.
2. Weight of water drawn from drip chamber per hour when the chamber was drained.	21.0 "
3. Weight of water drawn from separator per hour when drip chamber was drained.	4.5 "
4. Total weight of water drawn from drip chamber and separator when both were drained.	25.5 "
5. Weight of steam passing through separator per hour.	120 "
6. Percentage of moisture in the steam intercepted by the separator.	17.5

Oil separator test:	
1. Weight of oil introduced into pump cylinder.	15 oz.
2. Weight of oil withdrawn from separator attached to exhaust pipe.	13 "
3. Percentage of oil intercepted by separator.	83.7
4. Time required for introduction of oil.	2 hours
5. Weight of steam passing through per hour.	120 lbs.

The balance of the oil, 13.3 per cent., covers that which disappeared in lubricating the cylinder and working parts, that which clung to the sides of the pipes and the plates in the separator, and that which passed in with the exhaust steam and collected on the water of condensation, that in the last case being an exceedingly thin film which was barely perceptible.

#### New Laboratory for the University of Pennsylvania.

The civil engineering department of the University of Pennsylvania is making rapid advance. Through the active interest of one of the trustees, C. C. Harrison, sufficient funds have been raised for the equipment of a testing laboratory which will be fitted up in the basement of the college building. The equipment will consist of an Olsen testing machine of 100,000 lbs. capacity, operated by an electric motor, a 2,000-lbs. cement testing machine and certain smaller equipment.

The "Columbia" and the "James Toleman." The compound locomotive "Columbia," built by the Baldwin Locomotive Works, which, after being on exhibition at the World's Fair, was tried on the Chicago, Milwaukee & St. Paul, hauling the limited train between Chicago and Milwaukee, has been returned to Philadelphia.

The "James Toleman," the English four-cylinder simple locomotive, has been doing much better work lately. When first tried on the Chicago, Milwaukee & St. Paul in the freight service, it was found to be very deficient in steaming power, but after some changes its behavior has been improved. We have not been informed what changes have been made, but the following figures give the most recent performances of the engine: Feb. 20 it took 24 loaded cars and 2 empties from Milwaukee to Chicago, 85 miles, in 6 h. 45 min.; Feb. 21, from Chicago to Milwaukee, 22 loads and 26 empties in 6 h. 35 min.; Feb. 22, from Milwaukee to Chicago, 27 loads and 3 empties in 5 h. and 50 min.

Metropolitan "L" Bridge Across Chicago River. The Metropolitan Elevated Railroad Company has submitted to the Commissioner of Public Works of Chicago plans for its bridge across the Chicago River, between Jackson and Van Buren streets. It is a rocking bridge like that mentioned in the *Railroad Gazette* of Oct. 20 last. City Engineer Artingstall has approved the plans in a general way and they are now awaiting the formal approval of the Commissioner.

#### Fast Freight Run on the Illinois Central.

Mr. J. T. Harahan, Second Vice-President of the Illinois Central, gives us the report of a fast run recently made by a freight train on that road from New Orleans to Chicago. It was a train of 15 cars loaded with bananas, and left New Orleans on Feb. 20 at 12:25 p. m., arriving in Chicago on Feb. 22 at 12:15 a. m. The distance is 912 miles, and the total time on the road was 35 h. 50 min. The time used in stops was 1 h. 50 min., making the actual running time 34 hours. The average speed including stops was 25.45 miles an hour, and not including

stops was 26.82 an hour. The run was not remarkable for very high speeds, but for the steadiness with which the speed was maintained over the whole route, the time between division terminals varying only from a minimum of 3 h. 30 min. for 100 miles to a maximum of 4 h. 45 min. for 127½ miles.

#### The Cordite Suit.

Mr. Justice Romer, after a long trial, in which the most eminent counsel have been engaged, has decided that cordite is not an infringement of Mr. Nobel's patent for ballistite. The question was a highly technical one, and experts of great reputation and scientific attainments flatly contradicted one another. But the result of the evidence on the mind of the judge may be given in a brief excerpt from his judgment: "It (cordite) is made by a process which, though in some ways similar, is not identical with the process of Mr. Nobel. Cordite itself as an explosive is not in its qualities identical with ballistite, though it has considerable resemblance to it. Whether or not, regarded as a chemical product, cordite is essentially different from ballistite I cannot be sure, seeing how the eminent experts before me differ on that point. But in any case, in my opinion, cordite and its manufacture are not in substance covered by the claim made by Mr. Nobel in his specification, fairly considered." And so the judge holds that Mr. Nobel has failed to make out his case of an infringement of patent.

#### The Heilmann Electric Locomotive.

In *The Engineer* of Feb. 9 is a description of this locomotive and some recent tests in France, from which we gather the following:

The idea of a supply of electricity from a central station was considered out of the question, as the cost of putting down conductors upon the ordinary main lines of railroads would prevent it. The design therefore comprises a self-contained locomotive in which the total dead weight is employed for adhesion. The parts of the locomotive are a boiler, a stationary compound engine driving a dynamo, and a set of motors. By this arrangement the steam engine can be run at any desired speed, while the motors may run at a different velocity, thus avoiding the connection between the piston and the wheels, which is an objection to the usual locomotive. Mr. Heilmann has associated himself with Mr. C. E. L. Brown, and they together have designed the engine, dynamo and motor, which are briefly as follows: The boiler is the Lynch type, 26 ft. long, 6 ft. 4 in. in diameter and weighs, with water, 10 tons. Upon each side of the boiler are placed coal bunkers, the contents of which weigh about 15 tons. The boiler is at the trailing end of the engine, with sufficient space between it and the engine room for the fireman. The engine is placed transverse to the length of the car, is of the cross-compound type, and is designed to develop 600 H. P. The cranks are 180 degrees apart and the reciprocating parts are of equal weight, so that the engine is perfectly balanced. It is not reversible. The exhaust steam of the low pressure cylinder is carried along the outside of the engine underneath the fireman platform to the blast pipe.

The dynamos are of a six-pole type with a Gramme ring armature. The windings of the armature are of the same potential and join together, so that although the machine is provided with three pairs of collectors, it can work with one pair only. The collectors are carbon brushes, each one pressed separately by a spiral spring. The dynamo is provided with a secondary dynamo which furnishes the exciting current. This requires a 20-H. P. engine to drive it and it may also be used for lighting the train.

The motors are of the four-pole type, two poles being consequent, and there are only two bobbins. The armature is mounted upon a steel tube which carries the whole motor, and the tube is attached to the axle, but insulated from it by woodite. Westinghouse brakes are employed, but the shoes are applied to a drum fixed to the inside of the wheel instead of bearing upon the wheel tire.

Several tests have been made with this locomotive. One near Havre was over a line having a gradient of 1 in 125. The train was made up of the electric locomotive; weighing 110 tons, and the following cars: one dynamometer test car, one brake van, four first-class compartment coaches and one rear brake van. Total weight of the train, including locomotive and passengers, was 195 tons. The speed obtained on the gradient of 1 in 125 was 35.1 miles an hour, and on a level about 49.6. Somewhat higher speeds have been attained upon other days. To accomplish this the locomotive required one man to note the readings of the amperemeters and voltmeters, a pilot to control the Westinghouse brake and one to attend the motor switch and steam lever, one man to attend the exciter engine, a fireman and a helper and three oilers to attend the large steam engine, thus making one chief engineer, seven men and a helper. The complete set of readings are being carefully tabulated by the railroad company. It is reported that during the trip one man was required constantly to throw water upon the slidebars, connecting-rods and piston-rods to keep them from heating, in addition to two other men who were constantly oiling the parts. In this present state, certainly, the engine requires far more attention than could possibly be given to it in ordinary working.

#### THE SCRAP HEAP.

##### Notes.

The Southern Pacific Railroad has lately put in use a set of quadruplex telegraph instruments on the line between New Orleans and El Paso.

The Denver & Rio Grande Express Co. has secured the express contract on the Union Pacific, Denver & Gulf Railroad, and will extend its business over that line on April 1.

A locomotive engineer by the name of Ackerman, on the Mexican Inter-Oceanic Railroad, has been imprisoned at Toluca, Mex., on account of the death of a Mexican who was struck by Ackerman's engine. The accident occurred about a year ago.

Evans, the California train robber, has been caught and sentenced to imprisonment for life. Press dispatches giving this information say nothing as to what

crime the sentence applies to, or whether Evans was connected with the train wreck reported last week.

A cyclone swept over the Island of Mauritius on Feb. 23 causing much damage and killing many persons. Among other disasters was the overturning of a railroad train, which fell down a high bank, injuring nearly all the passengers. It is said that the number killed was five, although the first reports gave it as 50.

The towboat *Coal City*, en route from Pittsburgh to New Orleans with a tow of coal, struck the middle pier of the bridge at Memphis on the night of Feb. 24, and ten barges of coal were sunk. The steamer was not much damaged by the collision, and, after a few hours' delay, proceeded on her way south, but she struck a hidden obstruction at Peters Towhead the next day and three more barges were sunk.

The upper house of the Virginia Legislature has rejected the bill to increase the liability of railroad companies for injuries suffered by their employees. It appears that the proposed law for appointing railroad inspectors in Massachusetts has for its main object "the protection of railroad employees from accident." The Massachusetts Legislature has before it a bill to permit street railroads to carry parcels and merchandise. The counsel of some of the steam railroads appeared at the hearing and opposed the bill.

The Standard Code of Train Rules was the subject of an address by Mr. Isaac H. McEwen at Buffalo last Sunday, the audience being composed of railroad men of that city, and the object of the meeting to raise money for the benefit of men who left the Lehigh Valley road in the strike last fall. The sale of tickets amounted to \$400. From the reports in the Buffalo papers it would appear that Mr. McEwen gave a practical talk on those rules which have aroused the most discussion, presenting the different views concerning them in a way to stimulate the interest of his hearers in the subject as one of importance to them.

The Receivers of the East Tennessee, Virginia & Georgia have ordered a general reduction of wages to take effect April 1. The pay of trainmen, switchmen and others who worked for low pay for several months and who then demanded and received a restoration (on Feb. 1) is now to be reduced 10 per cent. Other employees will be cut 5 per cent. The Philadelphia, Reading & New England has reduced wages 10 per cent., the order applying to all employees receiving \$1.25 a day or more. The reduction on the Cleveland, Cincinnati, Chicago & St. Louis, recently announced, is said to affect all the shops of the company, and to amount to about 10 per cent. The Philadelphia & Reading has ordered all its shops to be run on full time, 10 hours a day, after March 1, but the employees in the Mechanical Department, except those receiving \$1.20 a day or less, are to have their pay reduced about 10 per cent. The Receiver of the Western New York & Pennsylvania has ordered a 10 per cent. reduction in wages March 1.

#### South American Notes.

The exports from Great Britain to Brazil for the eight months from January to September, 1893, were \$27,455,000, being a gain of \$6,105,000 for the corresponding period of 1892.

The Argentine Government has authorized the payment of a liberal subsidy, based on the tonnage of vessels, to any steamers that may be placed in commission for the coasting trade of that republic.

The Buenos Ayres Great Southern Railroad has made some successful trials of petroleum as a fuel for its locomotives. The intention is to substitute petroleum for coal on this line, in order to avoid the danger of setting fire to the pampas by sparks.

A petition has been presented to the Chilean Congress asking for a charter for a new railroad between Valparaiso and Santiago, passing through Casablanca. This would be a more direct line than the present one *via* Quillota, the saving in distance being about 40 miles.

The report of the Lima Railways Co., Ltd., for the half-year ended June 30, 1893, announces gross receipts of \$132,231, with operating expenses at 55.38 per cent., thus leaving net earnings of \$59,000, or \$3,371 a mile upon its 17½ miles of track. The gross receipts decreased 21.43 per cent. over the corresponding period of 1892, this being due to the fall in exchange. There has been a still further decrease since June 30, attributable to the financial depression in Peru incident upon the decline in silver.

It is stated that Mr. Minor C. Keith, the builder of the Costa Rica Railroad, is about to undertake some important improvements in Port Limon, the Caribbean port of entry for that republic, among which will be the construction of a sea wall, the filling in of swamps adjacent to the town, the macadamizing of the principal streets, and the installation of an electric light plant. Mr. Keith is also the concessionaire for an extension of the railroad system northward through the San Carlos Valley to the Nicaraguan frontier, in connection with which Costa Rica has made some valuable grants of lands.

On the Cartagena-Magdalena Railroad the grading is reported to be practically completed for the entire length of the line. About 38 miles of track has been built from Cartagena. The line has been in operation as far as Turbaco (23 kilos.) since June, and will be opened to Arjona (38 kilos.) Feb. 1, the work being pushed as fast as possible, and the engineers expect to finish tracklaying in July and to open the road in August to Calamar. This road is being built by an American company, with Thomas R. Wheelock President; F. B. Beaumont, Secretary and Treasurer, 50 State street, Boston; S. B. McConico, Vice-President and General Manager, and John H. Butler, Chief Engineer and Superintendent, and W. D. Warren, Bridge Engineer, the latter with headquarters at Cartagena, Colombia.

According to the Brazilian Constitution the capital of the republic was to be removed from Rio de Janeiro to some point in the interior in the plateau of Goyaz. The

commission appointed in 1892, with Dr. Cruls, Director of the Rio Observatory, as president, to locate the future capital, has recently reported, having surveyed a territory in the Pyreneas Mountains, at an elevation of about 3,000 ft. above the sea. The climate is dry and healthy, the mean average temperature being 66 deg. F. The distance of this zone from Rio de Janeiro in a straight line is 605 miles, the nearest railroad terminus being at Uberaba, in the State of Minas Geraes, to which point the Mogyana line has been extended from Sao Paulo. While the proposed change of the capital to a point so far in the interior has been severely criticised, it is evident that if the capital is removed to the site recommended it will lead to a railroad extension into the interior which will result in a unification of interests of the important central states more quickly and surely than anything else that is liable to happen to Brazil.

The project for a railroad from Payta in the northwestern part of Peru to the head of navigation on the Amazon at the gorge known as the Pongo de Manseriche, is again being agitated, and it is said that the Peruvian Congress contemplates offering a concession for such a line. The project has much to commend it. The distance is about 350 miles (about 275 miles in a straight line), and the road would pass through both moist and tropical lands as well as through elevated temperate regions. There would thus be great diversity of products which would tend to maintain an equality of traffic throughout the year. The pass over the Andes by this route is the lowest so far known to exist between Panama and southern Chili. Vessels of 5 ft. draft can reach the Pongo, and communication is open from this point to all parts of the Amazonian River system. The railroad itself would pass through a large area of virgin rubber country, and would lead to the development of a gold-bearing district now too remote from transportation facilities to be exploited economically.

A bill has been introduced into the Chilean Congress having in view the removal of the customary parliamentary difficulties of obtaining concessions for railroad construction. According to this proposed arrangement all that a company desiring to build a railroad shall be obliged to do is to organize according to existing laws, and submit its plans for approval to an ordinary court of law, which shall pronounce its decision after notice of application shall have been published for 15 days in the *Diario Oficial*. The judge shall set a time limit for the completion of the road, and may extend it for just cause. This judicial decision gives the right to condemn private lands, damages being fixed by the same court, and it also gives the privilege of appropriating such public or municipal lands as may be necessary free of cost to the company. Railroads constituted in accordance with this act may not use public roads as part of their routes, nor cross them at grade. All freight and passenger traffic must be approved by the state as heretofore. It is thought that this bill will encourage the establishment of numerous branch lines, thus affording better transportation facilities through the rural districts. That some such encouragement to the farmer in Chili is needed may be judged from the fact that of a total population in the republic of 3,000,000 no less than 2,000,000, or 66 per cent., live in cities of over 5,000 inhabitants, and it is estimated that 80 per cent. of the population comes under the head of "urban."

#### The Inter-continental Railroad.

Mr. William F. Shunk, of Harrisburgh, Pa., has lately sent to the printer his report on the survey of the Inter-continental Railroad, and he tells the newspapers some of the points which it contains. From New York to Buenos Ayres the distance is 4,300 miles, which could be reduced to 4,000. The cost of the roadbed and bridges on the line to be built would be \$30,000 a mile, and for a road and equipment, ready for operation, \$50,000. The northern division of the line surveyed lies along the Pacific slope from Tehuantepec to the Bay of San Miguel, crosses the Isthmus, thence to the river Atrato, and ascends the Suelo, an affluent of that river, to the vicinity of Antioquia. The southern division ascends the valley of Canca River for 300 miles, and thence forward occupies an upland ranging from 7,000 to 12,000 ft. above the sea, between the great Cordilleras of the Andes, blocked by occasional cross ridges.

#### One of the Uses of the Conductor's Valve.

The following is a specimen (condensed) of the important information that some papers print in the form of special dispatches from various "news" centers. This was dated Chicago: "John O. Otis, a passenger on an Illinois Central train to day, lost an overshoe overboard. He set the air-brakes, brought the train to a stop, got off and recovered his overshoe. The 7:04 train from Kenwood was well under way when Otis discovered that in getting on he had lost his overshoe. He rushed to the valve and set the air-brakes so suddenly that the train stopped as if it had struck a stone wall. The passengers were thrown off their feet and in one car a number of men and women were tumbled in a promiscuous heap on the floor. As soon as order was restored the train backed slowly, the rear platform crowded with trainmen and passengers in search of some bleeding and mangled body. Otis jumped off and ran ahead and recovered his shoe, but the conductor realized the situation and signaled to the engineer to go ahead so that Otis got his shoe but was left behind."

#### Evils of the Jury System.

United States Judge A. J. Ricks, of Cleveland, delivered an address on the above-named subject in the Lenten services at Trinity Cathedral in that city on Feb. 14, from which we print a short extract:

"My subject is one of great public interest and urgency. The right of trial by jury is one of the most ancient and highest privileges accorded to the citizens of this enlightened country. The obligation to serve as a juror is one of a mutual character, which citizens owe each other. It is no answer to a reproving conscience to say that men ought to settle their controversies out of court. Citizens and corporations are frequently brought into litigation as defendants against their will. If every citizen would avail himself of the right to interpose excuse from duty only in emergencies, there would still remain a sufficient number in the great body of the public to give the courts the very best jurors. The wholesale exemptions now in force, especially in our large cities, take from the list of jurors many of our best citizens. The evils resulting from these wholesale exemptions are apparent. The demoralizing influence of excessive verdicts against corporations and of so-called speculative suits is by no means local in its nature. So long as these verdicts are returned against railroad and insurance companies the average citizen may not feel especially interested in the results. But the spirit of greed extends to individuals, so that an employee who has been injured considers it rather good than bad luck. Judgments are

often allowed in such size that they amount to extortion. It is too often the case that men on the juries are prejudiced strongly in favor of the individual as against the corporation. This has caused many a person to go to law against a corporation in a spirit of vindictiveness when he knew that he himself was the one to blame. I do not mean to say that all suits for personal injury are of this character. We need intelligent jurors to make the discrimination. I know of no way in which the evil can be more promptly overcome than by every citizen to do his duty.

If I could repeal all the exemptions and compel every citizen when summoned to serve as a juror, I would agree to fill the jury boxes in every city in Ohio with a class of jurors that would expel from the courtrooms every unjust and speculative suit. Both attorneys and litigants would feel that it was time wasted to present fictitious claims to 12 high minded and impartial jurors. I venture to say the number of judges now on the bench in Cuyahoga and Hamilton counties could transact all business that would legitimately come into court with one-half the labor that is now imposed upon them."

#### Shipbuilding on the Lakes.

Work on the North West, the first of the Great Northern's steamers, is being pushed at the yards at Cleveland, so that she can be put in commission before June if possible. The President and his cabinet are to be asked to take a trip up the lakes on the North West early in the summer. Work is now being hurried on the North Land, the second boat of the line. It is hoped to have it ready before the end of the season.

The Goodrich Company is intending to build a steamer similar to the Virginia, which is one of the best boats on the lakes. The boat will probably be built either in Detroit or Cleveland.

It is rumored that the Wheeler Yard in Bay City, will secure contracts for six ocean steamers, averaging 332 ft. in length, and costing, in the aggregate, in the neighborhood of \$2,000,000. On account of the short locks on the Welland and St. Lawrence canals these boats will be built in two parts and joined together at Montreal.

#### Vibrations of Tall Buildings Caused by Wind Pressure.

During the recent storm in Chicago when the velocity of the wind as observed at the United States Signal Service station was as high as 84 miles an hour, observations were taken of the vibrations of the Monadnock and Pontiac buildings by Mr. W. L. Stebbins, civil engineer. An exceedingly sensitive level in which one division on the scale shows a variation of five seconds was set up on the eleventh floor of the Monadnock in Mr. Stebbins' office, and the time of the vibrations was observed to be about two seconds. A 14 oz. plumb-bob was then hung in the north air well, the point of suspension being on the sixteenth floor, and the plumb-bob itself vibrating just above a drawing board placed on the second floor. The curve here traced was a circle  $\frac{1}{8}$  in. in diameter. The plumb-bob was then suspended in the south air well extending from the seventeenth to the second floors, and the observed curve was elliptical, the major axis being north and south and  $\frac{1}{8}$  in. in length, and the minor east and west with a length of  $\frac{1}{8}$  in. In the Pontiac building the same plumb-bob hung in the freight elevator shaft from the fourteenth floor gave an elliptical curve with a major axis  $\frac{1}{8}$  in. long and extending east and west, the north and south axis being  $\frac{1}{8}$  in. Observations were also taken in the Monadnock building with a transit sheltered so as to be unaffected by the wind. The one taken in the northwest corner showed a vibration of  $\frac{1}{8}$  in. and that in the southwest corner an average vibration of  $\frac{1}{8}$  in. with a maximum of  $\frac{1}{4}$  in.

The Monadnock building is 400 ft. x 67 ft. and 182 ft. high, the largest dimension being in the north and south line. The north half is built of heavy masonry, while the south half, being of more recent construction, is a steel framework with light walls. It may be noticed that the greatest vibration of the south half was in the direction of the length. The Pontiac is of steel frame construction and is 100 ft. x 68 ft. and 175 ft. high, the length being in the same direction as that of the Monadnock. The wind during the storm was northeast.

#### CAR BUILDING.

The Delaware, Lackawanna & Western has asked bids for building 10 passenger cars.

The Mount Vernon Car Co., of Mount Vernon, Ill., has an order for 100 refrigerator cars for the Mobile & Ohio.

The California Fruit Transportation Co. placed an order last week with the Wells & French Co., of Chicago, for 100 cars. The cars will have the Sharon steel truck, Hutchins roof and insulation, wooden brake-beams, and Wells & French contracted chill wheels. Some of the cars will be equipped with the California coupler and the remainder with the Chicago coupler.

#### BRIDGE BUILDING.

Baltimore, Md.—The people in the northwestern part of the city are urging the City Council to authorize the erection of another new bridge across the valley at Jones Falls in order to give greater accommodation for travel to North Baltimore. It is claimed that though bridges have been built across Jones Falls at intervals of about a block on the average from the harbor to Maryland avenue there is no bridge for nearly two-fifths of a mile between Maryland avenue and the temporary North avenue bridge.

Brantford, Ont.—The Onondaga township council in tends replacing the old bridge at Howell's mill by a first-class iron structure to rest on stone abutments. John Fair, engineer for the township, is preparing plans and specifications.

Calais, Me.—Next spring a new steel bridge will replace the historic old Ferry Point bridge.

Columbia, Tex.—R. C. Duff, Secretary of the Brazos River Construction Co., Columbia, will receive bids for the construction of an iron and steel bridge across the Brazos River at Columbia. The contract will be let at Brazoria, Tex., on March 15 by J. P. Underwood, Chairman of the Bridge Committee.

Columbus, O.—Following were the bids on the superstructure work for the St. Clair avenue viaduct: Dun, Perley & Co., of Columbus, \$19,999 and \$25,036; Sawyer & Arthur, of Columbus (five bids), \$17,995, \$19,980, \$21,849, \$22,624 and \$23,399; Etna Construction Co., Columbus (six bids), \$18,997, \$20,316, \$27,590, \$22,706, \$16,564 and \$12,856; Columbus Bridge Co., \$20,708, \$23,306, \$24,274 and \$25,245; Brown Ketchum Iron

Works, Indianapolis, \$16,106 and \$21,583; Indiana Bridge Co., \$21,000 and \$24,000; J. P. Hampshire & Co., Jackson, Mich., \$23,554, \$25,874 and \$32,000; Canton Bridge Co., \$25,650 and \$19,580; G. W. Knopf, Pittsburgh, Pa., \$18,200 and \$20,200; Jackson Bridge Co., of Jackson, Mich., \$19,670, \$22,045, \$29,206 and \$26,262; Shiffler Bridge Co., \$25,900; Massillon Bridge Co., \$28,050; Penn Bridge Co., Beaver, Pa., \$19,850, \$21,100 and \$22,750; Toledo Bridge Co., ironwork, \$16,590 and \$16,800, buckle plates extra; Pittsburgh Bridge Co., \$22,500 and \$25,500; King Bridge Co., Cleveland, \$22,137, \$25,682, \$28,301; and \$28,301; R. F. Hawkins Iron Works, \$21,800 and \$25,300; Edge Moor Bridge Works, Edge Moor, Del., \$17,300 and \$13,887, buckle plates extra; Variety Iron Works, \$26,500; Detroit Bridge Co., \$17,000, buckle plates extra; S. H. Martin, Columbus, \$11,300, \$12,000, \$11,700, \$13,600 and \$17,000; Bradbury & Spencer, \$19,850, buckle plates extra; Grotton Bridge & Mfg. Co., \$24,000, buckle plate extra; W. A. Maloney, \$19,500, \$19,200, \$19,900, \$21,300, \$21,600 and \$23,700; Mt. Vernon Bridge Co., Mt. Vernon, \$19,550, \$26,915 and \$29,900; Youngstown Bridge Co., \$21,870 and \$26,630; Phoenix Bridge Co., \$19,000, \$18,000, \$27,500 and \$20,750; Wright Iron Bridge Co., \$31,953, \$27,465, \$32,723, \$29,445, \$22,345, \$36,478, \$28,345, \$35,378 and \$25,473.

The appropriation for the viaduct is \$60,000. The Etina Construction Co. has been awarded the contract.

**Duluth, Minn.**—The long contest over a bridge across the St. Louis between Duluth, Minn., and Superior, Wis., which has been carried on before the house committee on commerce at Washington, has been decided by a report to the House of Representatives authorizing the Duluth & Superior Bridge Company to build the bridge. Several amendments proposed by the Secretary of War were attached to the bill.

**Hanover, Ont.**—Tenders will be received up to March 19 for the erection of a steel bridge over the Saugeen River on the Durham road, immediately west of Hanover. Contractors are to furnish their own plans and specifications. Address, James Lockie, Deputy Reeve, Hanover, Ont.

**Helena, Mont.**—The County Commissioners of Lewis and Clarke county, last week opened bids at Helena for the construction of the proposed bridge across the north fork of the Sun River. The bridge is to be built jointly by Teton and Lewis and Clarke counties. There were 12 bidders and 16 bids, as follows: S. M. Hewitt & Co., \$7,587; Bullen Bridge Co., \$7,700; Wrought Iron Bridge Co., \$7,000 to \$7,700; Gillette-Herzog Mfg. Co., \$7,497; King Bridge Co., \$7,999; George K. Reeder, \$8,411; H. L. Cooper, \$7,600; Wisconsin Bridge & Iron Co., \$7,222, \$8,600; M. S. Parker, \$7,605; Massillon Bridge Co., \$7,395 to \$7,400; Milwaukee Bridge & Iron Co., \$7,425; O. E. Peppard, four bids, \$6,259, \$6,282, \$6,517 and \$6,610.

**Lewiston, Me.**—The Maine Central Railroad is building a new 200 ft. iron bridge in the place of the old one near the Androscoggin River at Lewiston. About 600 ft. of the old bridge will remain as it is. At Lewiston Junction two new iron bridges have been built over the Grand Trunk on the new Portland & Rumford Falls road.

**London, Ont.**—The London & Port Stanley is applying to the Dominion Parliament for power to issue debentures to raise money for the renewal of the bridges, trestles and large culverts on the line, which are now wooden or partly so.

**Milwaukee, Wis.**—The contract for the superstructure of the Sixteenth street viaduct in Milwaukee has been let to C. L. Strobel, of Chicago, for \$182,000, as reported last week. The viaduct crosses the Menominee Valley and the tracks of the Chicago, Milwaukee & St. Paul Railroad. It is 4,000 ft. long and 60 ft. wide. The average height is 30 ft. and the spans vary from 30 ft. to 72 ft. in length. The girders are partly plate and partly lattice.

**New Westminster, B. C.**—Mr. R. Balfour has made a proposition to the City Council to construct a railroad and traffic bridge across the Fraser River, which is now being considered by the Council.

**Niagara Falls, N. Y.**—Several bills for building new bridges across the Niagara River have been introduced during the present session of the New York State Legislature. The last bill is to incorporate the Niagara Park Co., with a capital stock of \$400,000, to build two bridges across the Niagara River, one near Niagara Falls and the other near Whirlpool Rapids, in the interest of the companies operating the electric railroad at Niagara Falls. The following are interested in the new company: William J. West and W. Harry Cornell, of Niagara Falls; Charles Fell, John M. Brinker and C. B. Hill, of Buffalo; J. Harrison Mills, Frank E. Hayward, John H. Mooney, William A. Kelly, Charles F. Murphy and Anthony M. Alexanderson, all of New York City.

**Peterboro, Ont.**—Town Engineer J. E. Belcher has completed plans for a new bridge over the Otonabee River, near Auburn. It will consist of three 66-ft. spans.

**Reading, Pa.**—The Berks County Commissioners have been petitioned to erect a new iron bridge over the Sancony, at Heffner's Ford.

**Red Wing, Minn.**—C. F. Loweth, of St. Paul, has been engaged to prepare plans and specifications for the wagon bridge to be built across the Mississippi River at Red Wing by the City Government.

**Seranton, Pa.**—On Feb. 20 the qualified electors again passed upon the question of increasing the city debt \$250,000 for the construction of two steel bridges, one 900 ft. long, with a 33-ft. roadway and two 9-ft. walks, over Roaring Brook, and the other, 683 ft. long with a 34-ft. roadway and two 8-ft. sidewalks, at Linden street. Plans have been adopted for both structures. The Roaring Brook structure would cross the tracks of the Delaware, Lackawanna & Western and the Lackawanna Iron & Steel Co.'s yards, while the Linden street bridge would span the Central Railroad of New Jersey yard, the Ontario & Western track, and the Delaware & Hudson main line. The election resulted in a large majority in favor of the bridge propositions and the issue of bonds.

**Tacoma, Wash.**—The Board of Public Works having rejected all the bids for building the Eleventh street bridge which were submitted in the first competition, because no bidder agreed unqualifiedly to accept the city's bonds in payment, new bids were afterward called for, and the following were received: Missouri Valley Bridge & Iron Co., of Leavenworth, Kan., three bids, \$89,945, \$91,545 and \$94,445; King Bridge Co., \$93,000; Bullen Bridge Co., \$102,000; Hoffman Bridge Co.,

\$96,000; Pacific Bridge Co., \$98,000; Penn Bridge Co., \$96,800; H. Krusi (for San Francisco Bridge Co.), \$94,000; Puget Sound Dry Dock Co., \$98,000; Charles A. Sayre, \$103,463. The bidders all agree to take the \$120,750 issue of bridge bonds, paying par and accrued interest with the exception of the Puget Sound Dry Dock Co., which specifies "cash," and Mr. Krusi, whose bid was also qualified.

**West Chester, Pa.**—The County Commissioners have assured the Supervisors of East Goshen township and the West Chester Board of Trade that they will soon erect a bridge over Chester Creek at the Paoli road. The bridge will be of iron, and will cost about \$4,000.

**Woodstock, N. B.**—The contract for the superstructure of the Woodstock bridge has been awarded to the Canada Bridge Co., of Montreal, the amount of tender being \$42,500.

#### RAILROAD LAW—NOTES OF DECISIONS.

##### Carriers of Goods and Injuries to Property.

In Minnesota a contract for the transportation of horses provided "that the value of the live stock shall not exceed the following mentioned sums, to wit: Each horse, \$100; each ox, \$50; . . . such valuation being that whereon the rate of compensation to the company for its services and risk connected with said property is based." The Supreme Court rules that the sums named being average values of animals it was a just and reasonable mode of protecting himself against extravagant valuation in case of loss, and that recovery would be limited to the sums named, though the loss occurred through the negligence of the carrier or his servants.

The Supreme Court of Texas holds that where a contract for the shipment of live stock stipulates that the carrier shall be relieved from all liability after the delivery of the stock to its connecting line, no action will lie against the first carrier for injuries to the stock after it has been reloaded on the cars of the connecting carrier, caused by a defect in such cars.

In Pennsylvania some freight cars loaded with whisky were attacked and broken into by thieves and part of the whisky taken. The conductor and trainmen were present, but left and made no effort to protect the property. A body of citizens drove the thieves away and guarded the cars until the next morning, when, to keep it from falling into the hands of the mob, they destroyed the balance of the whisky. The Supreme Court rules that, as the employees abandoned the whisky and made no effort to protect it, the carrier was liable for its loss.

In New York it is laid down that where goods are shown to have been in good condition when delivered to a carrier for transportation, but were damaged when they reached their destination, the presumption is that the injury was caused by the negligence of the carrier, and the precise nature of the negligence need not be shown.

The Supreme Court of the United States has passed upon a question of importance to that portion of the traveling public known as commercial travelers. In this case a traveling salesman bought a ticket, and demanded a check for his trunk without saying anything as to its contents. The trunk contained a stock of jewelry, and defendants' baggage agent checked it without any inquiries. The car in which it was placed was thrown from the track, and the trunk and its contents were destroyed by fire. It was shown that it was usual to transport such trunks in this way. The Supreme Court holds that the jewelry was not "baggage" and the railroad company is not liable.

The Supreme Court of the District of Columbia rules that where the posting of schedules required by the interstate commerce act is solely for the information of the public, and is not necessary to the establishment of the rate; and hence, where a rate is known to the persons operating the railroad as a fixed rate, having a uniform charter, and undertaking to treat all shippers alike in proportion to the distance shipped, then such rate is established, within the meaning of the section making discrimination a crime.

In Connecticut the plaintiff left his hack and horses in charge of another at a point near defendant railroad company's platform, the usual place designated for that purpose by defendant, and a switch engineer, in the course of his business, brought his engine up to a point near this place, and blew several excessively loud blasts, the result of which was to frighten all the horses, and cause them to start forward, though accustomed to the noise of trains. "Though seeing that the horses were frightened, he continued to sound the whistle, and plaintiff's horses ran away, injuring themselves and the hack. The Court of Appeals rules that defendant's negligence was a question of fact, and a finding of the trial court that defendant was negligent could not be disturbed on appeal.

##### Injuries to Passengers, Employees and Strangers.

The Supreme Court of Missouri feels called upon to judicially declare that the declaration in the State Constitution (Art. 12, § 14), that railways within the state are public highways, does not authorize one to ride on a train without payment of fare, and in defiance of the regulations of the company.

In Indiana the Court of Appeals holds that a person who buys a ticket from a railroad is entitled to offer the same as fare only on a train which is scheduled to stop, for the purpose of receiving and discharging passengers, at the place mentioned in the ticket as his destination; and the fact that at such place there is a railroad crossing at which all trains are required to stop does not change this rule.

In California the Supreme Court rules that it is the duty of a railroad to stop its train at a station a reasonable time, so that passengers may get on and off its cars with safety to themselves; and, if it does not do so, it is guilty of negligence in starting the train without notice that it is about to start.

In Colorado a man asked a freight conductor on a railroad to carry him free to a certain point, saying that he had formerly been a railroad man, and was a cripple. The conductor refused. After the train had proceeded some distance, however, the conductor found deceased in the caboose. There were also in the caboose several persons traveling with stock, as well as a fireman seeking employment, none of whom were provided with transportation, or paid fare. The conductor, not liking to put the man off late at night, in the open country, allowed him to ride. The Supreme Court holds that he was not a passenger.

In Mississippi the plaintiff was injured while traveling on defendant's freight train, and claimed that he was a free passenger on such train, as part owner of a car load of stock being transported by defendant. The evidence showed that the stock was owned by one G., with whom the contract of carriage was made, and whose name alone appeared in the bill of lading, and

who was alone entitled, under the contract, to free transportation. Plaintiff's only claim to the stock was a verbal agreement with G. to buy part thereof after reaching their destination, if he could give proper security. Held, that plaintiff was a trespasser on defendant's train, and could recover only for injury caused by the wantonness or willfulness of defendant's servants.

In the Federal Court it is ruled that where an unlawful expulsion from a sleeping-car berth is the approximate cause of a married woman's miscarriage, the sleeping-car company is liable, though its servants were ignorant of the woman's condition when they expelled her.

In California it is held that carrying plaintiff beyond her destination and leaving her at the next station was not the proximate cause of her injury, she being struck by a train while walking back to her station along the track, the only direct way.

In Virginia, the plaintiff's ticket for passage over defendant railroad company's line provided that, when presented to the conductor for passage, plaintiff should sign his name thereto, and "otherwise identify" himself as the original purchaser of such ticket. The Supreme Court holds that, where defendant's conductor refused plaintiff's offer to identify himself by signing the ticket, he had no right to require him to "otherwise identify" himself, and defendant was liable for the conductor's expulsion of plaintiff from the train for refusal to pay fare.

The Supreme Court of Washington holds that where a motorman on a street car sees that a man driving a wagon along the track neither looks back nor pays any attention to the ringing of the bell by increasing his speed or attempting to leave the track, it is his duty to bring his car under control, and the company is liable for injuries to the passengers if he continues until it is impossible to stop.

The Supreme Court of Georgia rules that if a person who was killed on a railroad trestle while incumbered with a small boy could have saved himself, after discovering his danger from an approaching train, had he not been so incumbered, and his care for the boy was the chief reason why he did not succeed in protecting himself, he was, nevertheless, chargeable with ordinary care for his own safety, irrespective of the presence of the boy.

The Supreme Court of Alabama rules that where, in an action by a brakeman against a railroad company for injuries received in coupling cars, it appears that a rule of defendant's road prohibited its employees to go between cars to couple, and that plaintiff stipulated to abide by such rule, evidence is inadmissible to show that there was a custom on defendant's road for brakemen, when they found it impossible to make a coupling with a stick from the outside, to go in between the cars for that purpose, after having first signaled the engineer to stop the train.

In Alabama, in an action by the father against a railroad company for the negligent killing of a child 18 months old, it appeared that the child wandered unattended out of the yard and on the railroad track, which was about 50 ft. from the house; that it had gone upon the track just as the train was approaching, and that plaintiff knew the train was coming. He saw the child playing about the yard a few minutes before the train passed. The Supreme Court holds that plaintiff was guilty of such contributory negligence as to preclude a recovery unless it is overcome by more than simple negligence of defendant.

In the Supreme Court of the United States it is held that where a railroad, after purchasing an engine, made such reasonable examination as was possible without tearing the machinery to pieces, and subjected it fully to all ordinary tests for determining its efficiency and strength, and no defects were thereby disclosed, it was not guilty of negligence as to plaintiff, a stranger to it, because there existed in the engine a latent defect that afterward caused an explosion in its yard, whereby plaintiff was injured.

- <sup>1</sup> *Alair v. N. P. R. Co.*, 51 N. W. Rep., 1,072.
- <sup>2</sup> *Gulf, C. & S. F. Ry. Co. v. Tenant*, 22 S. W. Rep., 761.
- <sup>3</sup> *Lang v. Penn. R. Co.*, 26 Atl. Rep., 370.
- <sup>4</sup> *Bowden v. Fargo*, 22 N. Y. S., 889.
- <sup>5</sup> *Humphreys v. Perry*, 13 S. C. Rep., 711.
- <sup>6</sup> *United States v. Howell*, 56 Fed. Rep., 21.
- <sup>7</sup> *Fritts v. N. Y. & N. E. R. Co.*, 26 Atl. Rep., 347.
- <sup>8</sup> *Farber v. M. P. Ry. Co.*, 22 S. W. Rep., 631.
- <sup>9</sup> *C. C. & C. St. L. Ry. Co. v. Lightcap*, 31 N. E. Rep., 213.
- <sup>10</sup> *Carr v. Eel River & E. R. Co.*, 33 Pac. Rep., 213.
- <sup>11</sup> *A. T. & S. F. R. Co. v. Headland*, 33 Pac. Rep., 185.
- <sup>12</sup> *R. & D. R. Co. v. Burnseed*, 12 South. Rep., 953.
- <sup>13</sup> *Mann Boudoir Car Co. v. Dupre*, 54 Fed. Rep., 616.
- <sup>14</sup> *Henson v. Central Pac. R. Co. (Cal.)*, 32 Pac. Rep., 809.
- <sup>15</sup> *N. & W. R. Co. v. Anderson*, 17 S. E. Rep., 757.
- <sup>16</sup> *Pears v. Seattle Con. St. Ry. Co.*, 33 Pac. Rep., 389.
- <sup>17</sup> *A. & C. A. L. R. Co. v. Leach*, 17 S. E. Rep., 619.
- <sup>18</sup> *Richmond & D. R. Co. v. Hissong*, 13 South. Rep., 209.
- <sup>19</sup> *Al. G. S. R. Co. v. Dobbs*, 12 South. Rep., 776.
- <sup>20</sup> *R. & D. R. Co. v. Elliott*, 13 S. Ct., 837.

#### MEETINGS AND ANNOUNCEMENTS.

##### Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

*West Jersey*, semi-annual,  $\frac{3}{4}$  per cent. on the common stock, payable March 15.

##### Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

*Atlanta & Charlotte Air Line*, annual, New York City, March 14.

*Atlantic & Northwest*, special, Montreal, Quebec, March 27. To authorize the issue of bonds for the construction of the road, and to approve of the lease to the Canadian Pacific.

*Georgetown & Western*, annual, New York City, March 13.

*Grand River Valley*, Jackson, Mich., April 25.

*Gulf, Colorado & Santa Fe*, annual, Galveston, Tex., March 6.

*Missouri Pacific*, annual, St. Louis, Mo., March 13.

*New York, Lake Erie & Western*, special, New York City, March 6.

*New York & New England*, annual, Boston, Mass., March 13.

*New York & Rockaway Beach*, annual, New York City, March 27.

*Oregon, Short Line & Utah Northern*, annual, Salt Lake City, Utah, March 21.

*Pennsylvania*, annual, Philadelphia, Pa., March 13.

*St. Louis, Iron Mountain & Southern*, annual, St. Louis, Mo., March 13.

*Sterling Iron & Railway Co.*, annual, New York City, March 6.

*Wabash*, annual, St. Louis, Mo., March 13.

*Western Terminal Co.*, special, Pittsburgh, Pa., Mar. 20.

**Technical Meetings.**

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Master Car Builders' Association* will hold its annual convention at Saratoga, N. Y., June 12. The hotel headquarters will be at Congress Hall, H. S. Clements, Manager.

The *Master Mechanics' Association* will hold its annual convention at Saratoga, N. Y., June 18.

The *Freight Claim Association* will hold its annual meeting in Louisville, Ky., March 14.

The *National Association of Local Freight Agents* will hold its annual convention at Pittsburgh, Pa., June 12, 13, 14. The headquarters will be at the Monongahela House.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October. The next meeting will be on Wednesday, March 28.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November. The next meeting will be on Thursday, April 19, at 10 a. m.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except during June, July and August, at 8 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Tacoma Society of Civil Engineers and Architects* meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The *Association of Engineers of Virginia* holds informal meetings the third Wednesday of each month, from September to May, inclusive, at 719 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Western Society of Engineers* meets at 51 Lakeside Building, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas Place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. The next meeting will be Friday, March 16.

**Brotherhood of Railway Trackmen.**

The grand lodge of this organization has met at Battle Creek, Mich., and revised its constitution and by-laws. A new board of trustees was elected, of which William White, of Battle Creek, is the President and Secretary.

**Master Mechanics' Association.**

The committee appointed to report on Sanding Devices at the next convention has issued a circular asking information in regard to such devices, and requesting that drawings and descriptions of improved devices which may be in use be forwarded to the committee. Replies to the following questions are asked: 1. Do you consider the ordinary sand-lever arrangement a satisfactory and economical device for distributing sand upon the rails to prevent the driving wheels of locomotives from slipping? 2. Have you in use any improved device for sanding the track? If so, state what it is. 3. Does the improved sanding device which you have in use effect a saving in the amount of sand used, as compared with the ordinary sand-lever arrangement? 4. Give any data that you may have as to the amount of this saving. 5. Do you consider that the use of a sanding device which distributes a small quantity of sand evenly upon the rails increases the hauling capacity of locomotives or effects a saving in power and fuel over engines equipped with only the usual sand-lever arrangement? 6. Give any data that you may have as to the amount of this saving. 7. Do you notice any perceptible difference in the wear of the tires on engines in the same service, equipped with the improved sanding device, over engines using the ordinary sand-lever arrangement? 8. Do you consider that the use of a sanding device which does not sand the track too profusely, but distributes only a small amount of sand evenly upon the rails, reduces the liability of breakage of crank pins and rods, with their usual dis-

astrous results? 9. Does the improved sanding device which you have in use automatically sand the track when the air-brake is applied? 10. Give any data that you may have as to cost of sand per ton, delivered into the locomotive sandbox. 11. Give average weight of a box full of dry sand. 12. Give an estimate in tons of the average amount of sand used by each engine on your road in one year. 13. How fine a screen do you consider necessary in order to obtain the best results from the improved sanding device which you have in use? O. Stewart, F. M. Twombly, L. M. Butler, C. E. Fuller, John Medway, H. P. Robinson, Committee. Replies should be sent as soon as possible to O. Stewart, 226 North avenue, North Cambridge, Mass.

**Engineers' Club of St. Louis.**

A meeting of the club was held on Feb. 21 at the new permanent quarters, No. 1600 Lucas place, St. Louis, 25 members and 3 visitors being present. The special committee appointed at the last meeting to consider the subject of boulevards in the city of St. Louis made a report stating that after conference with committees representing the Society of American Architects, the Merchants' Exchange and other organizations, a preliminary plan for boulevards in the central part of the city and near the new Union Station had been considered, but no definite action taken, pending the enlargement of the general committee.

Mr. John Dean then read a paper on "The Manchester Ship Canal," discussing the preliminary work, the engineering features and the commercial effect of the canal. The original company was organized in 1882, and after mature deliberation adopted the lock plan. The Parliamentary grant was refused twice, but was finally passed in 1885, when \$2,000,000 had been spent on preliminary work. The estimated cost was \$50,000,000, and the actual \$70,000,000, which included a great deal of work not originally contemplated. The city of Manchester issued \$25,000,000 in bonds to aid the enterprise, and holds a controlling interest until these bonds are paid off. Manchester lies 35 miles east of Liverpool and is 60 ft. higher. The length of the canal is 35½ miles; the maximum cut was 66 ft., and the average 35 ft. There were 52,000,000 cubic yards of excavation, of which 12,000,000 were in rock. Capt. J. B. Eads was consulted regarding the original plans, and made some suggestions which were adopted and which proved of great value. Being lighted through by electricity, it is used by night as well as day. The clearance allowed under bridges is 75 ft., and the time of passage six to seven hours. Discussion followed by Messrs. Ockerson, Moore, Pitzman, Wheeler and Johnson.

**The Traveling Engineers' Association.****CARE OF POOLED ENGINES.**

The committee on "How Can Traveling Engineers Improve the Service when Engines are Double Crewed or Pooled?" desires answers to the following questions. This subject was continued from the last annual meeting, as it was not understood by the majority of the members. This plan of handling engines has been tried with more or less success for a number of years, and the committee request members to give the benefit of their experience: 1. State if you pool or double crew engines on your road or not. 2. What method do you use to keep up repairs, and by whom are engines cleaned above running board? 3. What system do you use to keep engines properly supplied with tools? 4. By whom are supplies placed on engines? 5. When and by whom are engines inspected? 6. How often are boiler checks and gage cocks examined and cleaned? 7. Do you clean fires at intermediate stations for firemen? If so, please state number of miles run, also give your opinion as to the waste of fuel in so doing? 8. Who takes care of the head lamp and signal lamps? 9. Are your engine tool boxes locked and the keys left at the office for the engineers to get when they take the engines? (This refers to small tools.) 10. Is the box containing frogs, jacks, saw and ax sealed as well as locked, and when the seal is broken a record kept of it? 11. Do you have all steam fittings in cab kept tight by other than engineer? 12. Is the packing of driving boxes and engine and tender trucks governed as much as possible by mileage? 13. Are the firebox, flues and front end inspected at stated intervals, or do you wait until "she don't steam"? 14. Are oil cans looked after and kept in proper condition? 15. Are sand boxes and pipes inspected and known to be in proper condition before the engine leaves the terminal? 16. Are rod cups adjusted by shop men and other automatic oilers inspected, so that all the engineers are required to do is to fill them? 17. On double crewed engines do you try to place men on opposite turns who are friendly and work in harmony with each other? 18. On double crewed engines do you give each engineer a set of oil cans? 19. Do you think it is practicable or economical to keep an inspector for double crewed engines?

Answers should be sent to W. T. Simpson, Chairman, 55 Bennett street, Battle Creek, Mich.

**FORM OF EXAMINATION FOR PROMOTION.**

The Committee on "A Uniform Form of Examination of Firemen for Promotion and New Men for Employment" desires answers to the questions printed below. At the last annual meeting it was the unanimous opinion that there should be a uniform form containing the best methods of examining men when employed and at different times after that, before being promoted to the position of an engineer. It is hoped by the committee that every member will answer the questions and in addition give the benefit of his experience on the subject.

1. Do you have any system of examination on your road that applies to firemen promoted to switch and road engines, and new men hired as road engineers? If you have, please send form to chairman of committee. 2. Is there any qualification necessary other than stated in examination? 3. Are applicants for position of firemen and engineers obliged to exhibit a specimen of handwriting in any other manner than filling out personal record? 4. What is the limit of minimum and maximum age of men employed as firemen? 5. Do you make any distinction in percentage of questions asked and answered properly by firemen to be promoted to switch or road engines? 6. What per cent. of questions must be answered to enable candidate to pass? 7. Do you have any form of certificate that you give to those who have successfully passed the examination? If so, please furnish the chairman a copy. 8. How is examination conducted—by a board of examiners, or one person, and is the one being examined allowed to have one of his associates (one who has passed the examination successfully) present during the examination? 9. In the air-brake examination, is it necessary to explain the action of air pump, pump governor, engineers' brake and equalizing discharge valve, triple valve, including quick action feature? 10. What means are provided for men to become informed as to the

best practical method of engine running and caring for engines, and becoming familiar with air-brakes, other than every day practice? 11. Do you examine applicants for positions of firemen, in physical defects, such as sense of hearing and color? 12. How do you examine regular employees for color defects and hearing? 13. What is the limit of maximum age of employed engineers? 14. Do you require employed engineers to pass a more rigid examination than firemen, when promoted? 15. Do you use a progressive form of examination for firemen? If so, please furnish the chairman a copy. 16. Do you examine a candidate in the office, or in the roundhouse with an engine to look at? 17. If the candidate fails to answer correctly any question about a common breakdown, or is unable to disconnect and block an engine, and if necessary set an eccentric, would that disqualify him?

Answers should be sent to M. M. Mehan, Chairman, 21 West Ridge Street, Marquette, Mich.

**M. C. B. Circular on Airbrake and Handbrake Apparatus.**

The Master Car-Builders' Association committee on the above named subject requests all members to give full and complete answers to the questions given below.

1. Do you use the Stevens or Hodge system of foundation brakes on your passenger cars? 2. How far from the center line of car do you place your handbrake wheel? 3. What is the diameter of the wheel? 4. Do you attach your brake chain direct to the shaft the hand wheel is on? 5. Do you increase its power in any way? 6. Do you use for freight foundation brakes the general plans for levers and connections shown on M. C. B. Standard, Plate No. 9—proceedings of 1893? 7. Do you use one or two handbrake wheels on a freight car? 8. What is the size of the wheel? 9. Do you use the sizes of iron for connections, levers and jaws indicated in Plate No. 9? 10. Do you use the 1½-in. drilled holes in levers, jaws, &c., as shown in Plate No. 9? 11. Do you use the standard pin, 1½ in. in diameter, as shown in Plate No. 9? 12. Do you use metal brake beams with airbrakes? 13. Do you use wood brake beams with airbrakes? (a) plain? (b) trussed? 14. When there are cars equipped with airbrakes in your freight trains, do you place them ahead and use the airbrakes? 15. Paragraph S, Sections 17 to 23, inclusive, defines the condition airbrakes must be in for interchange. Do you insist on these conditions in receiving cars? 16. How do you make your inspection? 17. If you find cars that do not fulfill these conditions and you think it necessary to do the work, do you make bill against the delivering road? Answer for each section separately. 18. Should the time (three months) named in Section 18 be extended? 19. Should it be one year, same as Section 17? 20. If cars are found with brakes not complying with Sections 17 to 23, are you in favor of making the necessary work chargeable to owners? 21. Are you in favor of striking from the rules any of the sections above mentioned, and placing them with our recommended practice? 22. Which ones? 23. What are you doing to maintain the brakes after the cars leave the shops? 24. Do you have airbrake testing plants outside of your main shops? 25. Do you have them at receiving tracks where you receive freight from your connections? 26. Do you have them at outside repair stations where you repair large numbers of cars? 27. Give description, with blueprints or diagrams if possible, of the plant you use. 28. Outline your system of handling the airbrake inspection of cars received from connections in interchange. 29. Outline system of taking care of defects found. 30. What defects would you remedy if the car were important freight (under Rule 3, sections above referred to)? 31. What if unimportant or empty? 32. Outline your system of handling airbrake inspection on repair tracks. 33. Do you test every car coming into repair tracks? 34. Would you advocate putting all cars into condition called for by Rule 3, or only your own cars, in the present state of the rules? 35. Do you allow the ordinary car inspector to make tests of airbrakes at your test plants, or is this part of the work in the hands of a special airbrake man? 36. Do you have any system of marking cars that have airbrake defects and which are not remedied when discovered? Describe it. 37. If a card, do you attach it to car? 38. Send sample with explanation. 39. Do you have any reports from trainmen covering airbrake defects? Describe them, and send sample with explanation as to how they are handled.

Answers should be sent, not later than April 10, to Mr. E. D. Bronner, Chairman (Michigan Central), Detroit, Mich.

**Conference of Railroad Young Men's Christian Association.**

The seventh international conference of the railroad department of the Young Men's Christian Associations will meet in New York City March 29 to April 1, the first session being Thursday evening. The conference will meet in the Railroad Men's building, 361 Madison avenue. The programme will be announced in a later circular. Each railroad association should be represented and Christian railroad men at unorganized division points are also specially invited to attend and take part in the discussions. The names of those desiring entertainment should be sent at as early a date as possible to G. A. Warburton, Secretary, 361 Madison avenue, New York City. The Chairman of the Railroad Committee is Mr. Charles F. Cox, 40 East Twenty-third street, New York.

**American Association of General Passenger and Ticket Agents.**

The thirty-ninth annual meeting of this association will be held at Hotel Royal Poinciana, Lake Worth, Fla., at 11 o'clock a. m., Tuesday, March 20, 1894.

In accordance with action taken at the Milwaukee meeting, the report presented by the committee appointed to consider the question of differences of opinion as to the proper methods of apportionment to be applied in the division of passenger fares, is to be further considered, and it has been suggested that a vote by lines be taken at this meeting. The question with respect to the practice of some ticket agents in applying directly to connecting roads for relief on account of errors in the sale of through tickets, which was presented by Mr. E. A. Ford at the Harrogate meeting, is also a subject for further consideration.

Mr. Samuel Powell, an honorary member, and for many years Secretary of the Association, will deliver the annual address.

**Engineering Association of the South.**

The regular monthly meeting was held at Nashville, Tenn., Feb. 8, Vice-President W. C. Smith presiding. C. E. Perin, A. E. Gaines, I. O. Walker and Alfred Hume were proposed for membership. As a committee to represent the Association in the convention soon to be held for organizing the Tennessee Centennial, Mr.

Newell Sanders, Chattanooga; Dr. W. L. Dudley, Nashville, and Maj. Niles Meriwether, Memphis, were appointed.

The following question is proposed for discussion at the next meeting, and written discussions are desired from members not in attendance: "What are the best and cheapest railroad culverts of areas under 50 sq. ft.?" The paper of the evening was presented by Mr. Tyler Calhoun, Superintendent Whitewell Colliery of Tennessee Coal, Iron & Railroad Co., describing a gravity system for handling coal at those mines by which the necessity for costly machinery has been obviated. The "Sewanee" seam, which is worked here, averages 3 ft. thickness and lies nearly horizontally under many square miles of the Cumberland Plateau, cropping out for over 50 miles along the face of the mountains on the west side of the Sequatchee Valley. The mines are 1,100 ft. above and one mile distant from the tracks of the N. C. & St. L. Railroad, while the mountain extends 300 or 400 ft. above the mines. Muir traction is used for mile haulage, the average haul being about three-quarters of a mile. The output is 800 to 1,000 tons per day. Mine cars hold one ton each, and the gage of the track is 26 in. At the mines the work of getting the cars to and from the tipsles and dumping them is done mostly by gravity. From these tipsles the coal is carried to the railroad chute by an incline operated entirely by gravity. The total length of this incline is 4,700 ft., and its rise 1,035 ft.; the maximum grade is 46 per cent, and the minimum grade 14 per cent; the track is of the three-rail type with a four-rail parting at the middle where the cars going meet those coming down; steel rails, 30 lbs.; gage, 4 ft. At each "trip" two cars, 5½ tons coal each, go down, both fastened to the end of a 1½-in. Hewitt interlocked wire rope, which passes over 8-in. cast iron rollers, spaced 40 ft. apart, and is wound 3½ turns around each of two 7-ft. drums at the top of the incline; at the other end of the rope two empty cars are drawn up, as the two loaded ones go down. These cars are shaped so as to have horizontal tops on the slope of the incline. The cars are controlled by a powerful hand band-brake at the drum, their speed being regulated by two fans, the shafts of which carry pinions that gear with spur wheels on the drum shaft, in such ratio that the resistance of the air on the fans balances the motive power on the incline when a speed of 1,200 ft. per minute is attained. Ten trips an hour are made. At the foot of the incline, the cars are uncoupled from the wire rope and run out 500 ft. to the railroad chute, dumped by dropping the bottoms, and run back to the foot of the incline, practically by gravity. The coal, after leaving the incline cars, passes, by gravity, over a series of short screens with a drop of 6 in. between each screen and the next, the screens being set on a general slope of 30 deg., and fitted with diamond top screen bars. The "fine" coal here falls into a bin, while the rest passes directly into a chute, 54 ft. long and lined with steel plates. Half way down this chute is another screen, with 3-in. spaces, which takes out the "nut" coal, the "lump" coal passing directly down the chute. Thus the screening and the loading on cars are both effected by gravity. The railroad tracks in the yard and on the scales are all graded for operation by gravity.

The fine coal passes through eyes in the bottom of the bin into five-ton funnel-shaped cars, which are run out by gravity on tracks across the tops of the coke ovens, into which the fine coal is dropped.

For draining the mines two siphons are used, each 1,200 ft. long, one 2-in. and the other 3-in. diameter, both discharging 300 ft. from the summit and 25 ft. below the elevation of the water in the sump. They are primed by one man without stoppage.

Gravity is utilized inside the mines, also in bringing down the coal; the miners undermine a few feet, allow their work to remain till morning, when the pressure of the roof is found to bring down the coal. There is not a steam boiler nor an engine about the works. Ventilation is accomplished by furnaces.

The regular monthly meeting will be held at headquarters in the Cumberland Publishing House in Nashville, Tenn., on Thursday evening, March 8. A paper entitled "Coal Handling Plant at Pikeville, Tenn.," will be presented by Mr. J. J. Ormsbee, M. E., Mem. E. A. S. The final report of the Executive Committee of the Engineering Societies, Columbian Exposition, will be read.

#### Engineers and Architects Club of Louisville.

Mr. H. P. McDonald will read a paper on Reinforcement of Foundations at the next meeting of the club, to be held in the Norton Building, Louisville, Ky., March 8.

#### PERSONAL.

—Mr. Horace Seeley, Assistant General Freight and Passenger Agent of the Des Moines Northern & Western, has resigned.

—Mr. E. N. Armstrong, General Superintendent of the Toledo, Peoria & Western, has been elected President of the Illinois Car Service Association.

—Mr. Benjamin A. Kimball, of Concord, N. H., who has been a Director of the Concord & Montreal for a long time, has been appointed Managing Director of that company on the resignation of Mr. MacKinnon as General Manager.

—Mr. J. W. McDill, of the Interstate Commerce Commission, has been ill at his home at Creston, Ia., for some weeks, and is now reported to be in a serious condition. Owing to his advanced age there is little hope of his recovery.

—Mr. David H. Baker, of the Pennsylvania Railroad, died at Jersey City last week at the age of 84 years. Mr. Baker had been for many years General Foreman of the Pennsylvania at Jersey City. Forty years ago he was Master Car-Builder of the New Jersey Railroad & Transportation Co., which was afterward leased by the Pennsylvania.

—Mr. D. C. Prescott, who has been General Freight Agent of the Concord & Montreal since 1891, has been appointed General Superintendent of the railroad. This is a new office, and was created on the resignation of Mr. T. C. MacKinnon as General Manager of the railroad, the office of General Manager having been abolished on his retirement.

—Mr. J. A. L. Waddell, of Kansas City, Mo., has been appointed Chief Engineer of the Jefferson City Bridge & Transit Co. This company proposes to build a highway and motor bridge over the Missouri River at Jefferson City, Mo. Mr. Waddell is now engaged in making borings at two crossings on which to base preliminary designs and estimates of cost.

—Mr. James Dun, of Topeka, Chief Engineer of the

Atchison, Topeka & Santa Fe, has recently been appointed Chief Engineer of the Colorado Midland, which is operated by the Atchison road. Mr. B. H. Bryant has been Chief Engineer of that railroad for some years, and has just completed the construction of the great Busk tunnel. He will continue to act as Superintendent of the railroad, to which office he was appointed after the Atchison railroad began operating the line.

—Mr. T. A. MacKinnon, General Manager of the Concord & Montreal, has resigned that office to become General Manager of the Boston & Maine Railroad. Mr. MacKinnon entered the railroad service when 24 years of age, and was clerk and timekeeper at the Passumpsic Road Shops at Lyndonville, Vt., until 1871, when he became Acting Superintendent of the same road. From 1873 to 1880 he was Superintendent of the Brockville & Ottawa and the Canada Central roads. For three years after this he was Assistant General Manager of the Southeastern Railway, and for four years' was General Manager. Later, after two and a half years service as General Superintendent of the Ontario & Atlantic Division of the Canadian Pacific road, he became Manager of Transportation, leaving that position in 1890 to become General Manager of the Concord & Montreal.

#### ELECTIONS AND APPOINTMENTS.

**Atchison, Topeka & Santa Fe.**—The jurisdiction of James Dun, Chief Engineer, has been extended over the Colorado Midland Division, vice V. H. Bryant, who will continue to discharge the duties of Superintendent.

**Baltimore & Ohio.**—S. B. Hege, for many years Passenger Agent of the company in Washington, D. C., has been made District Passenger Agent.

**Butte, Anaconda & Pacific.**—George Henderson has been appointed Master Mechanic, with headquarters at Anaconda, Mont.

**Camden & Atlantic.**—The annual meeting was held in Camden, N. J., Feb. 21, and the following directors were elected: George B. Roberts, William L. Elkins, Henry D. Welsh, William C. Houston, William Bettie, Edmund E. Read, Sr., William C. Dayton, Crawford Miller, Enoch A. Douzhty, John B. Hay, Samuel Rea, W. J. Sewell and Charles E. Pugh. The officers elected were: President, George B. Roberts, Philadelphia; Vice President, William J. Sewell, Camden, N. J.; Secretary, J. R. McClure; Treasurer, Robert W. Smith, Philadelphia.

**Central of Georgia.**—W. A. Moore, Superintendent of the Northern Division, has been appointed Superintendent of the Main Stem Division also, with headquarters at Macon, Ga., his jurisdiction now extending from Atlanta through to Savannah, a distance of 300 miles.

**Chicago, Fort Madison & Des Moines.**—E. F. Potter has been appointed General Manager to succeed J. C. MacKinnon, with office at Fort Madison, Ia. Mr. Potter was formerly Chief Engineer and Superintendent of the railroad.

**Delaware, Lackawanna & Western.**—The Directors have re-elected Percy R. Pyne, First Vice-President; E. R. Holen, Second Vice-President, and W. S. Sloan, Third Vice-President.

**Denver & Rio Grande.**—W. H. Rosing has been appointed Master Mechanic of the First District, First Division, of this railroad, with office at Burnham, Col., vice Quimby Lamplugh, resigned.

**Kansas City, Pittsburgh & Gulf.**—Richard Gentry, Second Vice-President, has assumed the general management of the property.

**Missouri Pacific.**—A. A. Heard, Chief Clerk in the passenger department at St. Louis, has been appointed Assistant General Ticket and Passenger Agent, to succeed B. H. Payne, resigned.

**Mobile & Ohio.**—The annual meeting was held in Mobile, Ala., Feb. 21, and the following directors were elected: James C. Clarke, H. B. Plant, A. H. Stevens, Sidney Shepard, Thomas W. Jenons, J. H. Fay, Adrian Iselin, Jr., F. D. Tappen, C. C. Cuyler, E. S. Knapp, E. L. Russell, James H. Masson, W. Butler Duncan.

**Monterey & Mexican Gulf.**—The following directors were elected at a special meeting held in New York City, Feb. 20: Geronimo Trevino, Jose la Garza Galan, Nicolas Regules, all of the City of Mexico; August Friesz, of Brussels; Paul Fuller, Joseph Kling, Joseph Richardson, George W. Seligman and Thomas S. Bullock, of New York.

**Northern Central.**—The annual meeting was held in Baltimore, Md., Feb. 23, and the following directors were elected: George B. Roberts, J. N. Hutchinson, B. F. Newcomer, John P. Green, Harry Walters, Henry James, Louis W. Hall, E. B. Parsons, J. D. Cameron, Luther S. Bent, Henry D. Welsh and N. Parker Shortridge. The following officers were also elected: George B. Roberts, President; Frank Thomson, John P. Green, E. Pugh, Vice-Presidents; Stephen W. White, Secretary, and A. W. Hendrix, Treasurer. After the election Mr. Roberts resigned as a director and A. J. Cassatt was elected to succeed him.

**Pennsylvania & Northwestern.**—The annual meeting was held in Philadelphia, Pa., Feb. 21, and the following directors were elected: E. J. Berwind, H. A. Berwind, John H. Converse, Aaron Fries, Stephen Greene, Samuel G. Lewis, John Reilly. Edward J. Berwind was elected President.

**Reynoldsville & Falls Creek.**—William F. Marshall has been appointed Superintendent, with headquarters at Reynoldsville, Pa., vice John H. Bell, resigned.

**St. Louis Southwestern (of Texas).**—The headquarters of J. A. Edson, General Superintendent, have been removed from Texarkana to Tyler, Tex.

**Union Pacific.**—B. Howard Payne, formerly Assistant General Passenger Agent of the Missouri Pacific at St. Louis, has been appointed Assistant General Passenger Agent of this road with headquarters at Omaha, Neb.

**Wabash.**—Alpheus Cyphers, Assistant General Eastern Agent, having resigned to engage in other business, Robert N. Collyer has been appointed to fill the vacancy with office at 400 Broadway, New York. E. H. Lake will succeed Mr. Collyer as Freight Agent, and C. H. Latta is appointed Southeastern Freight Agent to succeed Mr. Lake.

**Winona & Southwestern.**—The office of Auditor on the road has been abolished. H. S. Johnson, Treasurer for the Receiver, will assume the duties of this office. This order displaces E. G. Hornbroke, who has held the position of Auditor since the building of the road.

#### RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

**Allouez Bay.**—This company has filed articles of association in Wisconsin, with a capital of \$100,000. The company proposes to construct a railroad eight miles long around the southern border of Allouez Bay, from a point in the city of Superior.

**Baltimore & Drum Point.**—A small force has been working near Millersville, Md., since the work was commenced some months ago, under J. H. McCreary, of Washington, D. C., the contractor. The road has been graded for some miles south of Millersville, where the new line connects with the Annapolis, Washington & Baltimore toward Adertown, and the ties are now being distributed to Conowago. F. R. Heidler, of Baltimore, is Vice-President of the company.

**Bayfield Harbor & Great Western.**—The bonds voted by Bayfield, Wis., in aid of this road, \$50,000, will expire on April 1. A proposition to renew them, conditioned upon the projectors of the road forfeiting \$10,000 if they failed to construct the road next summer, has been rejected by the company.

**Beaver Meadow, Trescow & New Boston.**—This company has been incorporated in Pennsylvania to build a railroad 20 miles long, from a point on the Schuylkill Division of the Pennsylvania, near New Boston, to a point on the Delaware, Susquehanna & Schuylkill, near Beaver Meadows, passing through portions of Carbon, Luzerne and Schuylkill counties. The Directors are A. S. Van Winkle, A. M. Eby, C. J. Kirschner, J. F. Barber, W. L. Chamberlin and Philip Weaver, of Hazleton, and B. W. Wilde, of Milnesville, Pa.

**Brooklyn & Brighton Beach.**—The company has applied to the Brooklyn city authorities for permission to change the terminus of the road from Atlantic and Franklin avenues to Fulton street and Franklin avenue, so as to connect it with the Kings County Elevated by an elevated structure crossing Lefferts place and Atlantic avenue, and then extending over the present tracks of the Brighton Beach road until grade is reached. The object of connecting the two roads is to give rapid transit to Flatbush, and to run trains from the Brooklyn Bridge and Fulton Ferry in the summer to Coney Island. General Jourdan is the chief officer of both companies.

**Canadian Pacific.**—The newspapers in the Northwest report that this company has let the contract for the construction of a line 250 miles in length, extending from Nelson, B. C., through Crow's Nest Pass and Tobacco Plains to a point near Calgary, in Alberta. The report gives the name of Brown & Hollis, of New Westminster, B. C., as the firm of contractors which will build the line.

**Central Railway & Bridge Co.**—This company is applying to the Dominion Parliament for a charter with power to construct a road from a point on the Montreal, Portland & Boston or the Montreal & Sorel road, near the Town of Longueuil, Que., to connect with the Canadian Pacific, near Dalhousie Station, Montreal, with power to erect a bridge across the River St. Lawrence opposite Montreal.

**Chazy.**—The New York State Railroad Commission has granted this railroad, a Clinton County corporation, permission to build its line, which is to extend 1½ miles from Chazy, on the Delaware & Hudson Railroad, to the quarry and works of the Chazy Marble Lime Company.

**Chicago, Paducah & Memphis.**—The surveying party in charge of Chief Engineer Reed now running the preliminary line south of Altamont, Ill., has completed that work as far as Salem, about 30 miles south of the first named town and is now working towards Mt. Vernon.

**Chittenden County.**—The projectors of the proposed railroad from Burlington, Vt., are working under the charter of this road. The route is from Burlington through South Burlington, touching Williston, St. George and Shelburne to Hinesburg, about 12 miles. A preliminary has been made and about one-half of the right of way secured. It is proposed to use part of the old roadbed of the Burlington & Lamville road. Frank O. Sinclair, of Burlington, Vt., is Chief Engineer. The leading incorporators are Isaiah Dow, H. M. Hull, Albert Ray, of Hinesburg, Vt.; Henry Lawrence, of St. George, and C. W. Brownell, of Burlington.

**Choctaw Coal & Railway Co.**—It is announced that an offer has been made by a Western syndicate to holders in Philadelphia of the securities of the company to build 90 miles of a proposed extension of 125 miles. The consideration asked by the syndicate is a first mortgage on the road constructed. No other details are published and the names of those making the proposition are not disclosed. The company has been in the hands of Receivers since 1891, and various plans for its reorganization and the building of the proposed extension have been presented to the security holders, but none has been accepted by a majority of the holders. The company has valuable lands for about 40 miles along the eastern line of the road. The mining developments up to this time have been very good. The extent of the coal land controlled by the company is about 300,000 acres. The railroad now constructed amounts to 65 miles on the Eastern Division, from Wister Junction to South McAlester, and 33 miles on the Western Division from Oklahoma to Fort Reno. Charles Hartshorne, of Philadelphia, is President.

**Eddyville & Hickory Bush.**—This company was incorporated in New York this week with a capital of \$40,000 to build a steam road 3½ miles long from near Roundout Creek, in the town of Ulster, to Hickory Bush, in the town of Rosendale, N. Y. Among the directors are Ernest B. Ackerman, Plainfield, N. J., and F. S. Douglass, New York City.

**Elkton, Massey & Middletown.**—The effort to secure a new company, the Elkton & Southern, to build a railroad through Cecil County, Md., over practically the route proposed by the above line has resulted in a committee report to the Maryland Legislature, indorsed by the Cecil County representatives, confirming the claim of this company to the bonus of \$58,000 voted a few years ago for a line through Cecil County if the company commences the construction work within 90 days from the passage of the present bill. The building of this line would be in the interest of the Pennsylvania, and that company is understood to accept the conditions now proposed. The route is from Elkton through Cecil County to Middletown, Md.

**Florence & Cripple Creek.**—The weather has not interfered with the rapid progress of the work north of Florence, Col. The one short tunnel has been completed, and tracklaying has gone on at a rapid rate. The line will be completed by May to the Cripple Creek mines.

**Frederick & Middletown.**—The bill to incorporate this company to build a line between Frederick and Middletown, Md., about 10 miles, has been passed by the Maryland Legislature. B. H. Busard, of Middletown, and G. W. Smith, of Frederick, Md., are the chief incorporators.

**Greensboro & Federalburg.**—Joseph H. Bernard, one of the Directors of the local company, last week explained to a committee at Denton, Md., the present prospects for building the railroad. He said that Vice-President Thomson declined at present to make any definite promise in regard to building the railroad, but he stated that if free right of way was granted to the company the question might be taken up this spring. The proposed line is from Federalburg to Greensboro, Md., about 40 miles. Some years ago when the project was first started the legislature of Maryland granted the local company which was organized a bonus of \$80,000, which has not yet expired.

**Kenova.**—A charter was issued last week by the Secretary of State of West Virginia, at Charleston, to this company. The capital stock subscribed is \$10,000. The incorporators are: John M. Wingeman, William H. Trial, Walter J. White and Frederick W. Halsey, all of Philadelphia, Pa. The company proposes to build a road from the town of Credo, W. Va., in Wayne County, to the West Virginia approach of the bridge over the Great Sandy River, now in course of erection by the Chesapeake & Ohio. It will be a connecting line between the Ohio River Railroad, the Norfolk & Western, and the Chesapeake & Ohio. The principal office is at Kenova, W. Va.

**Meridian & Tusculhoma.**—C. W. Robinson, E. T. George and others of Meridian, Miss., are attempting to revive interest in the construction of this proposed railroad between Meridian, Miss., and Tusculhoma, Ala., 55 miles. A public meeting was held in Meridian recently at which Mr. Robinson announced that the projectors would agree to complete the line if the town of Meridian would give them a bonus of \$50,000, and an effort is now being made to secure that sum.

**New Roads.**—Engineer A. G. Lombard, of Helena, Mont., has completed the survey of a narrow-gauge railroad, 20 miles in length, to the principal mines in the Ten Mile basin, in the Rimini mining district in Montana.

A corporation with a capital stock of \$10,000 has been formed at Warren, O., to construct a road between the towns of Kinsman and Farmdale. Electricity, steam, or cable power is to be used. The incorporators are D. M. Yeomans, E. R. Brackin, J. W. Forbes, and J. A. Russell.

**New York, Lake Erie & Western.**—The second tracking on the Bradford Division between Mt. Jewett and Johnsonburg, Pa., 20 miles, will soon be completed. The work on the seven miles of the road between Mt. Jewett and Hutchins will be begun this month by the contractors, J. C. Allison & Bro., of New York. The double track beyond Hutchins was completed as far as Johnsonburg some time ago.

**Pittsburgh, Virginia & Charleston.**—The possibility of the extension of this line to Morgantown, W. Va., has been the subject for comment by the papers in Western Pennsylvania for some years, and on several occasions they have nearly built the railroad for the company. When the engineers of the Pennsylvania Railroad, which operates this line, made surveys early last summer along the west side of the Monongahela River, south of Brownsville, the present terminus of the road, they had little doubt that at last the company had seen the advantage and necessity of building the projected extension. The surveyors were recalled before the line was completed to Morgantown, but it is reported that the work has again been resumed. The distance is about 55 miles long, and would open up valuable coalfields in Southern Pennsylvania besides reaching a region rich in iron ore.

**Santa Fe, Prescott & Phoenix.**—The construction work on this line south of Prescott, Ariz., is still being carried on. The latest reports from the officers state that about 700 men are being employed on the work by the contractors, B. Lantry & Sons, of Strong City, Kan. Up to the present time about 48 miles of track has been completed south of Ash Fork, Ariz., on the Atlantic & Pacific. The present terminus is now about eight miles south of Prescott, to which point the railroad is in regular operation. The line south of Prescott is being built with maximum grades of 3 per cent. and a maximum curvature of 12 deg. The entire length of line from Ash Fork to Phoenix, according to the surveys, is 190 miles. The work is in charge of G. W. Vaughan, of Prescott, who is General Manager and Chief Engineer.

**South Jersey.**—The grading of the branch to Cape May, N. J., which was begun by E. A. Tennis late last year is now reported to be practically completed except a few miles at Cape May. General Manager L. M. Bullitt, of Philadelphia, announces that final arrangements have been made to complete the branch to that point. A contract has been let to the Bethlehem Iron Co. for the rails for the 26 miles between Tuckahoe Junction, where the branch leaves the main line of the road, south to Cape May. The ties are now being distributed and the contractor promises to begin laying the rails next week.

**Tacoma Eastern.**—It has been arranged to make a survey for the proposed extension from the present terminus near Tacoma, Wash., toward the Nisqually coal fields in Washington. The road is graded for about six miles out of Tacoma and the coal deposits are 40 miles from the city. The new line will traverse the Nisqually and Mashel River country to the Cowlitz pass. The coal mines are chiefly the property of the Nisqually Coal Co., in which Theodore Hosmer, I. W. Anderson and others are interested. C. B. Wright, of Philadelphia, is the chief owner of the road.

**Tacoma, Lake Park & Columbia.**—The directors at Tacoma, Wash., state that if pending negotiations are concluded the extensions on the line will be undertaken during the spring. The line now extends from Tacoma to Lake Park, a distance of 10 miles. When the company was reorganized two years ago it was the intention to extend the road to the Columbia River, through the Cowlitz Pass, and open up the rich region in Klickitat and Yakima counties, which it would traverse.

**Texas Midland.**—President E. H. R. Green announces that the Southern extension of the road will be completed and that trains will be running into Ennis, Tex., within three weeks. This is the shortest of the two extensions contemplated by the company. Work will begin upon the second extension, which has Paris for its objective point, soon after the first is completed.

**Utah & Los Angeles.**—The charter of this company, which proposes a new scheme for a line between Salt Lake City and Los Angeles, was filed at Denver, Col., last week. The incorporators are Charles Foxwell, George A. Evans, A. B. Smith and C. F. Avery, all of New York City.

**West Virginia Blue Line.**—This company was last week incorporated in West Virginia to build a road from Rowlesburg, W. Va., to Shafersford, on Cheat River. The company's office will be located at Parsons.

#### GENERAL RAILROAD NEWS.

**Central Vermont.**—The Grand Trunk Railway Company, a stockholder of the Central Vermont, has brought suit in the United States Circuit Court of Brattleboro, Vt., to restrain the latter company from making the proposed issue of \$1,000,000 additional capital stock. This was intended to be given as a bonus to subscribers to the new first mortgage bonds to be issued to pay off the Central Vermont floating debt.

**Chester & Lenoir.**—This railroad is now being operated by its own officers, the stockholders having recently secured the discharge of the Receivers who were appointed in January, and elected G. W. F. Harper, of Lenoir, N. C., as President. The road extends from Chester to Lenoir, N. C., and until recently was operated by the Richmond & Danville. It was surrendered by the Receivers of that company early this year, and since then the road has been operated by independent Receivers.

**Erie & Huron.**—The control of this property is said to have been secured by a number of New York and Cleveland people. They have extensive plans for the development of the property and propose to operate it in connection with transfer boats across Lake Erie to Cleveland from the terminus of the road at Rond Eau, Ont., which is nearly opposite Cleveland. The railroad is about 75 miles long, extending from Rond Eau Harbor to Sarnia, Ont., opposite Port Huron, and connects with the Grand Trunk, Canadian Pacific and Michigan Central roads. It is expected to develop a heavy traffic in carrying lumber from upper Michigan over the railroad and thence across Lake Erie to Cleveland.

**Evansville & Richmond.**—James B. Hay, a stockholder in this road, has made an application in court for the separation of the road from the "Mackey system." This road, begun some six years ago, is partly built, and the portion between Elora and West Port, Ind., is in operation. The complaint alleges that the road was built by the aid of the Evansville & Terre Haute, which gave its credit to the undertaking without right to do so. The guarantee of the new road's bonds by that company enabled them to be placed on the market. The complaint asks for the total separation of the two roads, and that the Evansville & Terre Haute shall be no longer answerable for the principal and interest of the bonds of Evansville & Richmond.

**North Galveston, Houston & Kansas City.**—This railroad is to be sold at foreclosure at Galveston on March 6, under an order granted by the Texas District Court at Galveston, on Jan. 27 last. The road is 35 miles long, extending from Virginia Point, opposite Galveston, to North Galveston and Clear Creek. It was built in 1892 by L. F. Menange, then President of the Minneapolis Trust Co.

**St. Louis & San Francisco.**—Attorneys representing the United States Trust Co., trustee for the general bondholders of the railroad, last week asked Judge Caldwell in the United States Court at St. Louis to appoint separate receivers for the property. The bondholders also want this case transferred from the Federal Court to the State Circuit Court at St. Louis. The petition sets forth that there are differences as to the interchange of traffic, apportionment of charges for transportation and use of equipment; therefore a separation of the conflicting interests is asked. The case will be contested.

**Union Pacific.**—The following table gives the earnings and expenses of this system for the month of December and for the year ending Dec. 31:

UNION PACIFIC SYSTEM.				
Month of December.	1893.	1892.	Inc or dec.	
Miles operated.....	8,166	8,157	9	
Gross earn.....	\$2,756,329	\$3,722,013	D.	\$965,684
Oper. expen.....	1,974,016	2,553,702	D.	579,686
Net earn.....	\$782,313	\$1,168,311	D.	\$385,998
Since Jan. 1:				
Gross earn.....	\$37,445,416	\$45,025,176	D.	\$7,579,760
Oper. expen.....	25,618,464	28,513,840	D.	2,895,376
Net earn.....	\$11,726,952	\$16,511,336	D.	\$4,784,384

The gross and net earnings of the more important lines of the company are given below.

OREGON SHORT LINE & UTAH NORTHERN.				
Month of December:				
Gross earn.....	\$385,047	\$574,771	D.	\$189,724
Net earn.....	133,244	213,700	D.	80,456
Since Jan. 1:				
Gross earn.....	5,861,634	7,201,199	D.	1,339,565
Net earn.....	2,299,498	2,932,548	D.	603,050

OREGON RAILWAY AND NAVIGATION CO.				
Month of December:				
Gross earn.....	\$312,176	\$396,422	D.	\$84,246
Net earn.....	57,258	108,887	D.	51,629
Since Jan. 1:				
Gross earn.....	3,868,113	4,831,792	D.	963,679
Net earn.....	1,021,749	1,511,072	D.	489,323

UNION PACIFIC, DENVER & GULF.				
Month of December:				
Gross earn.....	\$397,023	\$506,214	D.	\$109,191
Net earn.....	97,287	138,756	D.	41,469
Since Jan. 1:				
Gross earn.....	5,093,332	5,885,526	D.	792,194
Net earn.....	1,912,893	1,466,688	D.	453,798

#### TRAFFIC.

##### Traffic Notes.

The Texas Railroad Commissioners have approved the rules of the Texas Car Service Association.

Chairman Caldwell, of the Western States Passenger Association, has organized a local passenger committee at Boston, composed of the agents of the Western roads.

Baltimore capitalists interested in the Baltimore & Ohio Railroad are about to establish a steamship line between Baltimore and Tampico, Mexico. The principal freights from Baltimore to Tampico are coal and coke.

The Louisville & Nashville last week gave notice that it would withdraw from the Southern Passenger Association on March 1. Notices of withdrawal seem to be

about the only implements of warfare available to the Southern roads, so far as one can judge from the press dispatches.

The presidents and managers of the Trunk Lines and Central Traffic roads met in New York this week to consider eastbound and westbound freight rates and eastbound passenger rates. It appears that irregularities exist in all parts of the territory of these roads.

Judge Butler, in the United States Circuit Court at Philadelphia, has granted a mandamus requiring the Pennsylvania Railroad to make specific answers to charges alleging violations of the Interstate Commerce Act. The order was secured in a suit in which the company is charged with giving rebates on coal from the Broad Top, Westmoreland and Clearfield regions to South Amboy, N. J.

#### Chicago Traffic Matters.

CHICAGO, Feb. 28, 1894.

Nothing can now stop a war in trans-continental passenger rates on March 1 except the Southern Pacific withdraws its notice, which some think may yet be done. The Santa Fe has met the situation by reducing the rate from Missouri River and Texas points, including Denver, Colorado Springs and Pueblo, to Mojave, Los Angeles and Southern California points westbound from \$50 to \$20, a cut of \$30, and \$35.50 for the round trip, effective March 1. Adding the Southern Pacific arbitrary from Mojave to San Francisco, the rate from the Missouri River to San Francisco is \$31, against the old rate of \$50, a reduction of \$19. These rates, added to the rates east of the Missouri River, make a one-way rate of \$32.50 from Chicago, round trip \$55.50, good for 60 days. The same rates are made eastbound from Southern California points. The Southern Pacific has given notice that it will meet these rates via both Ogden and El Paso. The reduction via Ogden is made in connection with the Burlington and Union Pacific, and will have the effect of bringing down all intermediate rates. A meeting of the Western Passenger Association will be held as soon as the members can be convened and efforts made to confine the demoralization in their territory within the closest possible limits.

The eastbound freight and passenger situation remains in a precarious condition. The roads which have been endeavoring to keep up the 25 cent basis on eastbound grain rates have now thrown up the sponge, in the face of the secret rates of 20 cents which have been made for some time, and yesterday all the lines put in effect an open tariff of 20 cents, Chicago to New York, on grain and grain products, with corresponding reductions to intermediate points. Other reductions are looked for. The situation is so threatening that a meeting of the Joint Committee has been hastily called for to-day at New York.

No settlement has been reached with the Canadian Pacific regarding passenger rates. At the meeting last week it demanded a percentage of the California business equal to what it obtained in 1892, and in addition to be allowed differentials of \$7.50 first class and \$5 second class via Victoria. This proposition was referred to a committee to report to-day. There is no probability that the Western Passenger Association lines will agree to it.

The Chicago & Ohio River lines are endeavoring to patch up their agreement again and re-establish their association.

The general passenger agents of the Western lines have asked their managers to approve their recommendation that on and after April 1, the sale of 2,000 mile individual mileage tickets at \$50 with a rebate of \$10 be abolished, and instead that 1,000-mile tickets be sold for 2½ cents a mile, good to bearer. They argue that this action will not only do away largely with the manipulation of these tickets by scalpers, but will also satisfy many of their patrons who cannot afford to buy 2,000-mile books good only for individual use.

The Western Passenger Association has agreed to reduce the minimum from 250 to 100 persons as necessary to secure excursion rates.

The Western Freight Association will hold its regular meeting next week in order to discuss the questions relating to the making and filing of tariffs which are again to be taken up by the Interstate Commerce Commission March 14.

Managers of the other lines are still endeavoring to persuade the Santa Fe to withdraw its notice of withdrawal from the pass agreement and feel somewhat encouraged that it will do so.

A conference has been arranged for between the Union Pacific and the Executive Committee of the Western Passenger Association at which a further attempt will be made to harmonize the Union Pacific with the westbound immigrant agreement.

The Chicago Board of Trade and the Chicago Freight Bureau have filed bills of complaint with the Interstate Commerce Commission against the eastbound lines, excepting the Grand Trunk, similar to the bill filed by the Cincinnati Board of Trade, against the uniform classification and bill of lading. The Chicago & Grand Trunk and the Chicago & Erie have repudiated the uniform bill of lading, and the indications are that it will soon be withdrawn.

No progress toward a settlement of the eastbound passenger troubles was made at the meeting last week, and a further meeting is to be held at Buffalo next week.

The shipments of eastbound freight, not including livestock, from Chicago, by all the lines, for the week ending Feb. 24 amounted to 58,968 tons, against 48,131 tons during the preceding week, an increase of 10,837 tons, and against 75,315 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Feb. 24.		W'k to Feb. 17.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	5,047	8.5	4,721	9.8
Wabash.....	4,706	8.1	4,633	9.6
Lake Shore & Michigan South.....	11,436	19.4	7,910	16.4
Pitts., Ft. Wayne & Chicago.....	7,138	12.1	5,389	11.2
Pitts., Cin., Chicago & St. Louis.....	8,617	14.6	6,933	14.4
Baltimore & Ohio.....	2,779	4.7	3,003	6.3
Chicago & Grand Trunk.....	5,001	8.5	4,098	8.5
New York, Chic. & St. Louis.....	7,323	12.7	5,210	10.8
Chicago & Erie.....	4,497	7.6	4,363	9.1
C., C. & St. Louis.....	2,224	3.8	1,871	3.4
Totals.....	58,968	100.0	48,131	100.0

Of the above shipments 3,929 tons were flour, 28,003 tons grain and millstuffs, 8,797 tons cured meats, 10,026 tons dressed beef, 1,393 tons butter, 1,697 tons hides and 2,916 tons lumber. The three Vanderbilt lines carried 40.6 per cent., the two Pennsylvania lines 26.7 per cent. (Other Chicago traffic news will be found on page 155).